THE ENGINEERING AND MINING JOURNAL

Entered at the Post-Office of New York, N. Y., as Second Class Matter.

VOL. XXXVI. WITH SUPPLEMENT. No. 24.

RICHARD P. ROTHWELL, C.E., M.E.,
ROSSITER W. RAYMOND, Ph.D.,
CHARLES KIRCHHOFF, Jr., M.E., } Editors.

NOTE.—Communications relative to the editorial management should be addressed to EDITOR, P.O. Box 1833, New York.

Communications for Mr. RAYMOND should be addressed to ROSSITER W. RAYMOND P.O. Box 1465, New York. Articles written by Mr. RAYMOND will be signed thus *; and only for articles so signed is he responsible.

SUBSCRIPTION PRICE, including postage, for the United States and Canada, $4 per annum; $2.25 for six months; all other countries, including postage, $5.50 = 22s. = 28 francs = 22 marks. All payments must be made in advance.

FILE COVERS will be sent by mail for $1.25 or delivered at office for $1 each.

Advertising Rates.—See page vii.

Mr. C. A. Green is our accredited representative for New York.

Mr. A. R. Brown, Jr., is our accredited representative for Boston and the Eastern States. Office, Room 1, Simmons Building, 40 Water street, Boston.

Mr. J. Viennot, 150 South Fourth street, Philadelphia, is our accredited representative for Philadelphia.

Mr. A. H. Taylor is our accredited representative for Chicago and the Northwest.

Mr. O. D. Cotton, Columbus, O., is our accredited representative for Ohio, Kentucky, and Indiana.

Mr. O. J. Frost, care Boston & Colorado Smelting Company, Argo, Colo., is our accredited representative for Denver and vicinity.

REMITTANCES should always be made by Post-Office Orders or Bank Drafts on New York, made payable to THE SCIENTIFIC PUBLISHING COMPANY.

THE SCIENTIFIC PUBLISHING CO., Publishers.

R. P. ROTHWELL, Pres. HENRY M. GEER, Sec. and General Manager,

P.O. Box 1833. 27 Park Place, New York.

CONTENTS.

EDITORIALS: PAGE.

The Scaling-Down of Prices of Labor Means Lower Prices for the Product of the Works ... 365
The Leadville Meeting of the Lead Interests ... 365

CORRESPONDENCE:

A Correction ... 366
The Theory of the Action of the Circular Saw in Cutting Cold Iron ... 366
Sampling Doré Bars ... 366
The Schwartzkopff Safety Apparatus *vs.* the Evans Safety-Guard ... 366
The Mine Engineering Profession ... 366

Carbon Deposits in Incandescent Lamps 367
The Theory of the Crucible Steel Process ... 367
The Origin of Gold in Certain Victoria Quartz Reefs ... 367
Dredging at Oakland Harbor, California ... 368
The Liability of a Boiler Inspection Company ... 368
A Suggested Cure for Blast-Furnace Chills ... 369
The Hoisting-Engine of the Bindweide Mine, Germany ... 371
Furnace, Mill, and Factory ... 371

NOTES: PAGE.

Monument to the Inventor of the Hot Blast ... 366
A New Cartridge ... 366
The Transmission of Energy ... 371

GENERAL MINING NEWS:

Arizona ... 372
California ... 372
Colorado ... 372
Dakota ... 373
Idaho ... 373
Michigan ... 373
Montana ... 374
Nevada ... 374
New Mexico ... 374
Pennsylvania ... 374
Utah ... 374

FINANCIAL:

Gold and Silver Stocks ... 375
Copper Stocks ... 375

BULLION MARKET ... 375
METALS ... 376
IRON MARKET REVIEW ... 376
COAL TRADE REVIEW ... 378
Advertisers' Index ... xii

NOT a day passes but what the announcement comes from several quarters that there has been a temporary suspension at rolling-mills or steel-works. This is followed, generally, within a week or less, by the statement that work has been resumed, after an agreement on the part of the workmen to accept a reduction of wages, ranging generally from 10 to 15 per cent. No one who has during the past year had occasion to buy or sell crude or manufactured iron will be at a loss to understand the reason. The decline in values has been continuous, and in the aggregate large. Manufacturers have seen their margins of profit shrink away, in spite of advantages which close buying of raw materials have given them. They have been forced to go before their workmen with the alternative of asking concurrence in a reduction of wages or of submitting to a closing down of the works. If only from selfish motives, manufacturers are loth to take such a step. It is satisfactory to note that there is not, so far as we know, a single instance or indication of a protracted struggle. The men understand how serious the situation is, and see the necessity of bearing their part of the burden of hard times. On the other hand, this general acceptance of the inevitable, the universal scaling-down of wages, means unfortunately that there is once more room for lower prices for the product of the works. In times of excessive competition like these, a reduction in the cost is a strong temptation to lower offerings. The eagerness to secure orders will too soon induce the producer to sacrifice a part of the ground he has gained by lower wages. Looking the facts squarely in the face, the very circumstance that we hear more of a scaling-down of wages than of shutting-down of works indicates that "bed-rock" has not been reached. When the men begin to feel that they would rather not work at all than work at the wages offered them, and when their employers are indifferent as to their decision, then, in times like these, the reaction is near.

WE are pleased to notice, from a perusal of the Colorado papers, that those who are prominently identified with the great lead interests of that State have taken steps to inquire into the means of seeking relief. A meeting has been held in Denver, at which the following gentlemen were present, so that the gathering was a fairly representative one: W. H. STEVENS, Chairman of the Executive Committee of the Iron Silver Mining Company; JACOB HOUGHTON, Secretary; COLONEL PIERCE, a director; WILLIAM AHRENS, General Manager of the same company; W. L. CHURCH, Manager of the Terrible Mining Company; W. S. WARD, of the Morning and Evening Star mines; TINGLEY S. WOOD, of the Silver Cord; EDWARD EDDY, of the Omaha & Grant Smelting and Refining Company; H. I. HIGGINS, of the American Mining and Smelting Company; HENRY COOM, of the La Plata smelter; CHARLES LIMBERG, of the Arkansas Valley smelter; A. S. HUGHES, of the Denver & Rio Grande Railroad; Mr. KEELER, of the Union Pacific; Mr. CROSBY, of the Burlington & Missouri; and Pool Commissioner DANIELS.

It was decided to form an organization, to be known as the Western Mining and Smelting Association, and a committee, consisting of Messrs. W. S. WARD and CHARLES LIMBERG, was appointed to draw up a constitution and by-laws, to report at a subsequent meeting, while Messrs. T. S. WOOD, JACOB HOUGHTON, EDWARD EDDY, and HENRY COOM were appointed a committee to gather statistics.

This is a movement in the right direction, which we trust will find the general support and co-operation which it deserves. How far it will be able to apply the only remedy which we believe will meet the situation, remains to be seen. There has evidently been some talk of a restriction of production, and it is stated that even now, with the stoppage of the Silver Cord, Henriett, and St. Bernard, with the reduced shipments of the Iron Silver, and the decline in the output from mines in other parts of the State, there has been a decline in the ore production equivalent to the make of 150 tons of bullion a day. We can hardly say, however, how any particular good to the Colorado miners and smelters would result from an agreement to run at half capacity. They will be hardly credited with the generosity of standing in the breach for others, even if more than one half of the producers would agree. It would simply be offering a premium to those who would be unkind enough not to agree with them as to the necessity of the measure. The Missouri, Utah, Nevada, Idaho, and New Mexico producers would give them all the encouragement they wanted, and would go on making and selling lead, the price of which would be maintained by their humane Colorado brethren. As reported, the gentlemen gathered at Denver were unanimous in saying that the last thing they would do would be to cut down the wages of their employés, who are now earning $3 and $4 per day. This sentiment does them credit, but is it business? If they agree upon a policy of restriction, do they put any more money into their workmen's pockets? We believe that their workmen would rather work at a reduction of wages of 30 per cent full-time, than lie idle half the time at present rates. Their argument that every other means of obtaining relief should be exhausted before steps are taken to lower wages is sound. They must, as they are preparing to do, have railroad freights reduced to a reasonable figure, and only those conversant with the facts can tell whether there is much margin or not. It is unjust to assume that the freights from Leadville should be as low proportionately as those from Utah. Shippers from Salt Lake City are said to be enjoying the poor satisfaction of being temporarily able to send base bullion from there to Omaha for $5 per ton, because the Union Pacific and the Denver & Rio Grande roads happen to be on the war-path. This will not last long, and after enough money has been wasted by the railroads, the Utah smelters will be happy in the conviction that they will be made to pay for the piper.

After an adjustment of the freight rates, the Western Miners and Smelters' Association will have to take up the wages question, because we do not believe that a general reduction of the output can or will be agreed upon. There are few mines so situated that, with a plethoric treasury, they can afford to shut down rather than exhaust their resources in putting on the market ore near in value to the present selling price. They are merely taking their chances that they will get something in the future which is now worth little. Their number, though it has been increased recently by an important producer, is limited.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes. We do not hold ourselves responsible for the opinions of our correspondents.]

A Correction.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The translator of Mr. Cumenge's report on the Rio Tinto, in the JOURNAL for November 24th, quotes Mr. Cumenge's analysis of rich matte produced from rich ores as containing tin, 26·74 per cent. It should be, iron, 26·74 per cent, as may be seen by referring to the original paper, "Pièces annexés," p. xi. Mr. Cumenge's report being in every sense of the word a typical one, he would, no doubt, be pleased to have this error corrected. Truly yours, A. WARTENWEILER.

BUTTE CITY, MONT., Dec. 2.

The Theory of the Action of the Circular Saw in Cutting Cold Iron.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: On several occasions, I have had discussions as to the theory of the action of the circular saw in cutting bar iron (cold), one party maintaining that the saw did not touch the iron; the other, that the iron was cut by the friction of the saw in contact with the iron. Believing that some of your readers will be able to give a decision that will settle the question, will you be kind enough to give this letter a place in your valuable paper? Respectfully, JOHN HENRY HARDEN.

PHŒNIXVILLE, CHESTER COUNTY, PA., Dec. 11.

Sampling Doré Bars.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: It has been asserted, in a letter from London, that if silver bars be sampled from dippings or granulations taken from the black lead crucible while the metal is in a molten condition, true results can never be verified by assays. In consequence, we shall be obliged if you will insert the following three questions in an early issue of your paper, and advise us upon the answers received. Of the three following methods of sampling doré bars of bullion, from which is the most reliable assay to be obtained? 1. By chipping corners of bar? 2. By borings taken from the ends of top and bottom of bar? 3. By dippings or granulations taken from the black lead crucible in which the bar is melted after a thorough stirring, and immediately before pouring the bar?

Yours truly, WILLIAM E. WALL,
Superintendent Alice Gold and Silver Mining Company.

WALKERVILLE, MONTANA, Dec. 7.

The Schwartzkopff Safety Apparatus vs. the Evans Safety-Guard.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Mr. Joseph M. Locke, C.E., M.E., in giving five reasons why the Evans safety-guard, described by him in your issue of December 1st, is superior to the Schwartzkopff safety apparatus, seems to have entirely overlooked that the scales may also be turned the other way. I can give five good reasons why the Evans safety-guard is by far the inferior of the two inventions:

1. Its action depends upon a number of mechanical parts which may get out of order, and are more difficult to examine than the working condition of an electric alarm.

2. The indication of "low water" is very clumsy and not delicate. A considerable portion of the "boiler-tubes" must be exposed before the alloy will liquefy, as, in this case, it is cooled by the surrounding steam, and can only fuse if heated to the temperature corresponding to "undue pressure." Mr. Locke will agree with me that to allow the water in a boiler to sink below the tubes is not good steam-engineering.

3. If the boiler is fired dry, no alarm whatever is given, and should the fireman fail to "see" that the lever of the safety-valve has moved (which may easily occur at night), he will spoil the boiler by continued firing, or have an explosion, in spite of the safety-valve being open, as soon as he pumps water into the red-hot boiler.

4. Without an electric alarm, no notice of the abnormal condition of the boiler is conveyed to the office of the superintendent.

5. The alloy, remaining in contact with another metal—no matter what that metal is—must soon deteriorate, and change its point of fusion, which can not take place in Schwartzkopff's apparatus. This is one of the most serious objections.

No wonder the Evans safety-guard met with "vindictive opposition from large numbers of steamboat engineers." That Schwartzkopff's invention is of greater merit than Mr. Locke is disposed to accord to it, is apparent from its introduction in Europe. To show that some very eminent engineers are using and recommending it, I give the names of a few establishments only which have adopted Mr. Schwartkopff's safety apparatus: The Prussian Artillery-Works, Spandau; Siemens & Halske, Berlin; Siemen Brothers & Co., Limited, London; A. Borsig, Berlin; Bochum Cast-Steel Works, Bochum; Austrian Northwestern Steamship Company, Vienna; the Hamburg Gas-Works, Hamburg; Austrian Alpine Mining Company, Vienna; the Société Industrielle, Warschau.

WASHINGTON, Dec. 13. C. A. STETEFELDT.

The Mine Engineering Profession.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Probably there is no profession, and certainly none of the engineering professions, whose special field of work is so generally poorly defined in the public mind, and so much invaded by men who bear the same relation to the mining engineer that the quacks and the shysters do to the medical and the legal profession. This fact is not as apparent in the East as in the West. Here, we find many surveyors who make a business of surveying mineral claims, and whose education and experience have not extended beyond that class of work, who not only advertise themselves as "civil engineers," but also generally claim the profession of "mining engineers." They are men whose knowledge of mining engineering consists in the ability to distinguish between the different ores common to the immediate district in which they are located, and to map a mine. Any knowledge of geology, assaying, metallurgy, mine timbering, or of any but the simplest problems of underground engineering, is utterly foreign to them. In addition to this class, the mining engineer is obliged to compete with the "practical miner mining engineer," who, while possessing none of the engineering training of the surveyor, and lacking the education necessary to the solution of geological and metallurgical questions, still has the advantage generally of sound common sense and practical experience. He, however, generally fails to take a comprehensive view, owing to his one-sided education and limited acquaintance with different mining sections. In the course of my experience in the Western mining States and territories, I have met many men of both the above types, and believe they number two to every one mining engineer who has earned by education, training, and experience the right to belong to the profession. What has been the result? The public generally accept a man at his own estimate, until they learn to the contrary. Every one calling himself a mining engineer has been employed in some capacity or other, and naturally, in two thirds of the cases, satisfactory work has not been obtained. The public loses confidence, and the profession suffers. As a fact to-day, some Western papers of prominence openly denounce the mining engineer and "expert," whom they regard as one and the same, and warn the investor to steer clear of him. The term "expert" is used most promiscuously, has become of very doubtful and not very reputable significance, and should be abandoned as applied to engineers. While every mining engineer should be an expert in mining matters, very few "experts" are mining engineers.

We have arrived at an era in the mining industry when the services of the legitimate engineer should be in demand. Mining is conducted more nearly on business principles, and is demanding more economical and skillful management than ever before. Investors and owners must see that in mining, as in railroading or manufacturing, success requires the aid of men specially trained for that work, and of practical experience in it, and that the day of the Eastern clerk as mine superintendent, the investor as his own engineer, and of all unqualified engineers has passed. The engineer should receive a reasonable fee for his services, and be consulted not only in cases of the transfer of property, but in all questions of actual mine development, such as the location of shafts and tunnels, the erection of hoisting or milling plants, etc. It is in the wrong solution of such vital questions of daily occurrence that many valuable properties have in the past few years been wrecked or burdened with an expensive system of development.

What, then, are to-day the requirements of a competent mining engineer?

1. A constitution able to stand hard work and privation; good digestion, muscular development, and eye-sight.

2. A scientific training and education, such as is now provided in the mining course in the leading mining schools of this country, namely, the Massachusetts Institute of Technology, and the Columbia College School of Mines.

3. Not less than five years' practical mining experience in the leading mining sections of this country, including work as prospector, common miner, mine foreman or shift-boss, and superintendent. This should include experience in working both bedded and fissure-vein deposits.

4. A character prominent for honesty, self-control, pluck, and perseverance.

The mining engineer who lacks any one of these four requirements is not qualified to practice his profession. I regard the mining engineering profession as becoming more and more distinct from that of metallurgical engineering, and believe they should be separated by our mining schools. Concentration, or the dressing of ores, however, is a branch belonging more particularly to the mining engineer, and a knowledge of that subject, as well as of the principal metallurgical processes, is necessary to him; but his specialty is the mine, not the reduction-works. The metallurgical treatment of mineral products is a distinct industry, and requires special training and experience, differing largely from that of the mining engineer. While the two branches of engineering are closely allied, each is a large field by itself, and either industry will be better served if men are specially trained for its requirements.

DENVER, COLO., Dec. T. E. SCHWARZ, Mining Engineer.

MONUMENT TO THE INVENTOR OF THE HOT BLAST.—A monument in memory of Mr. James Beaumont Neilson, of Queenshill, inventor of the hot blast, has been erected on Barstobrick Hill, Queenshill estate, near Kirkcudbright, by his son, Colonel W. Montgomerie Neilson. The monument is shaped after the pyramid style, and is built of large blocks of whinstone, with granite corners. Occupying a commanding position, it rises to a hight of 55 feet, and at the base is 20 feet square. On the north side is the inscription: "1883. W. M. N. Fecit." On the south side: "Neilson Hot Blast, 1828."

A NEW CARTRIDGE.—Mr. C. W. Curtis, of the firm of Curtis & Harvey, well-known English manufacturers of blasting-powder, is about to bring out a new invention. It consists of an entirely closed cartridge, in which the powder is fired from the outside. This is accomplished by means of a separate "exploder" placed on the top of the charge. This exploder differs from the ordinary fulminate detonator in two important particulars: it is charged with common gunpowder, and it is itself entirely closed. The advantages of a cartridge that has not to be opened to insert a fuse are obvious. The powder can not be brought into direct contact with fire, and none of the grains can be spilled and exposed to sparks and blows, either during transport or while in the hands of the miner. It would seem that this arrangement must give the greatest attainable degree of safety in the use of an explosive. Another advantage of a closed cartridge is, that in wet holes it remains secure against the entrance of water, since nothing is left to the miner's care. The employment of gunpowder in such cartridges in collieries must certainly conduce to the safety of the men.

CARBON DEPOSITS IN INCANDESCENT LAMPS.

In his inaugural address to the Newcastle-on-Tyne section of the Society of Chemical Industry, speaking of Dr. Fleming's experiments with Edison lamps and the copper deposit which takes place in them (*vide* the *Electrician*, vol. xi., p. 65), Mr. Barnard S. Proctor said: "In Swan lamps, the globe contains no material but the carbon filament, platinum wire conductors, and an infinitesimal residuum of air. Dr. Fleming says that when carbon is deposited on the inside of the Edison lamp, it is in a continuous coat, but when copper is so deposited, the molecules appear to be thrown off in straight lines from the point of heated metal, so that a shadow of the carbon filament is thrown upon the opposite side of the globe, the shadow consisting of a line of clear glass upon which no copper has been deposited. In Swan lamps which I have had the opportunity of observing, I have never seen such a shadow in either the carbon or the platinum deposit. My son, Mr. Charles Proctor, who is electrical engineer at the Swan Works at Benwell, informs me that these carbon deposits which occur when a lamp is overheated occur even more in lamps with the highest *vacua* than in those less perfectly exhausted. This would rather discourage the idea of the molecules being carried by currents in the residual air, and as yet we are wanting in evidence of the molecules being thrown off in radiations and equally wanting in any indication of the carbon having been in a truly gaseous condition. As the highest temperature to which the carbon can be raised fails to give any appearance of softening, I think we must give up any idea of the bending noted in 1878 being consequent upon an incipient plasticity; and if the smoky deposit is supposed to be the result of vaporized carbon, we may also suppose that it can not be melted except under the combined action of heat and pressure. Several lamps on the table illustrate the condition of the smoky deposit. There are four in which the deposit has accompanied the formation of an arc and four in which the arc has not been formed or the current has been stopped at the moment of its formation. In none of them can any symptom be observed which would indicate such a radial projection of molecules as to throw a shadow of the filament on the opposite side of the globe. There are also two broken globes, in one of which you may notice a patch of the deposit has been burned off by the heat of a spirit-lamp, showing that the deposit is almost entirely carbon. In the other fragments, the purple-black tint shows that an arc had formed by fracture close to the platinum wire, scattering platinum upon the glass almost free from carbon, as the film is little affected by heat and almost entirely removed by *aqua regia*. These deposits have all been formed intentionally by passing through the lamps stronger currents than they were intended to carry."

THE THEORY OF THE CRUCIBLE STEEL PROCESS.

Professor Ledebur, of the Freiberg School of Mines, is rapidly acquiring a high standing as an authority on matters pertaining particularly to the metallurgy of iron. In a recent issue of *Stahl und Eisen*, he has discussed a subject which will interest American steel-makers. We therefore reproduce a good translation of his paper from *Iron*.

There is not one of the more important metallurgical processes which has been more neglected by investigators than the manufacture of crucible steel. The reasons for the neglect are various. Many manufacturers suppose that the protection afforded by the crucible to the molten metal is sufficient to render any important chemical change impossible. Many smaller works also carry on their operations quite empirically, and do not trouble themselves either about the chemical composition of the charge or that of the finished cast-steel. Large establishments, however, which base their operations upon chemical examination, for reasons unknown to me, prefer to surround their manufacture of crucible steel with a kind of secrecy, even if they open their other departments most obligingly to the inspection of visitors and to scientific investigation. Even the smallest crucible steel-works often believe themselves bound to imitate the example of their larger competitors in this respect.

As is well known, MM. Troost and Hautefeuille have shown that silicon is reduced by carbon from crucibles containing silicic acid, and conveyed to the iron. It may be considered as proved that silicon reduces the property of liquid iron of secreting gases in solidifying, and thus acts beneficially in this respect. The process discovered by MM. Troost and Hautefeuille undoubtedly facilitates the obtaining of close castings in crucible melting; but few reliable data have as yet been published as to how far external conditions—especially the composition of the crucible and the composition of the charge—act upon the reduction of silicon in the crucible. A few experiments of Böker given in Wedding's *Darstellung des schmiedbaren Eisens* have reference only to the carbon contents of steel, and consequently do not permit of reliable conclusions as to the behavior of silicon. Two analyses made in Dr. Percy's laboratory on the influence of an addition of manganese, and which are reported in the above work (page 690), gave results the correctness of which must be strongly doubted (an aluminium contents of 0·12 per cent), and which possess little value because there are no data given of the composition and the quantity of the manganese alloy added.

As the reducing agent for silicon is in any case carbon, it may be assumed at once that this reduction will be greater if crucibles are employed containing large quantities of carbon (plumbago crucibles) than if crucibles are used containing little. The following information supplied by a friend confirms this theory. Equal charges, consisting of 30 per cent of crude steel and 70 per cent of wrought-iron, were melted in three crucibles of different carbon contents. The steel from bauxite crucibles with a carbon contents of 9 per cent contained 0·144 per cent of silicon; from fire-clay crucibles with 28 per cent of carbon, 0·274 per cent of silicon; and from fire-clay crucibles with 39½ per cent of carbon, 0·392 per cent. It is self-evident that the duration of the melting process and the melting temperature must also be of influence upon the reduction of silicon.

As regards the behavior of manganese in crucible melting, it has been proved by various recent examinations of other processes that the presence of manganese in iron may be an effective means of reducing silicon if opportunity is given for the protoxide of manganese formed to become saturated with silicic acid, and there is a high temperature. If spiegeleisen is melted at a high temperature in a cupola, with a lining holding silicic acid, it absorbs silicon, while manganese is eliminated, and may be changed into gray pig-iron. If gray iron containing manganese is melted repeatedly in the cupola, it remains gray all the longer—that is to say, it loses its silicon all the more slowly—the richer it was originally in manganese. It may therefore be assumed that in melting cast-steel in the crucible it would turn out all the richer in silicon the richer the charge was in manganese. In order to practically test this theory, at my request two charges of different percentages of manganese were melted under the same conditions in a large cast-steel manufactory. One charge consisted entirely of hearth steel, containing on analysis 1·29 per cent of carbon, 0·01 per cent of silicon (probably a constituent of the cinder), 0·12 per cent of manganese, and 98·50 per cent of iron. The second charge consisted of similar hearth steel, with the addition of 2 per cent of ferro-manganese, with 4·70 per cent of carbon, 2·07 per cent of silicon, 46·54 per cent of manganese, and 46·48 per cent of iron. Thus the second charge contained altogether 1·34 per cent of carbon, 0·05 per cent of silicon, 1·01 per cent of manganese, and 97·56 per cent of iron. The crucibles used contained in both cases about 39 per cent of carbon. The ingots received and analyzed by me contained:

	C. Per cent.	Si. Per cent.	Mn. Per cent
Without the addition of ferro-manganese	1·24	0·24	0·15
With the addition of ferro-manganese	1·86	0·49	0·75

The considerably larger increase in the percentage of silicon in melting the steel richer in manganese can not be mistaken. It follows, besides, from the analysis that the greater reduction of silicon was not only effected directly by the contents of manganese, but that the close affinity of the manganese remaining in the steel itself promoted the reduction of the silicon through the carbon of the crucible. If manganese serves as a means of reduction, the process taking place is evidently expressed by the formula: $2\,Mn + SiO_2 = MnO + Si$; that is, for 1 part in weight of silicon which is reduced, $\frac{110}{28} = 3{\cdot}93$ parts in weight of manganese must be oxidized. In the case before us, 0·49 — 0·24 = 0·25 per cent of silicon more is reduced in melting manganiferous steel than in melting steel poor in manganese. If this reduction were effected simply by manganese, it would only have required 3·93×0·25 = 0·98 per cent of manganese, which must have been eliminated from the steel, and the manganese contents of the latter could consequently have amounted to only 1·01 — 0·98 = 0·03 per cent, while the percentage was in reality 0·75. It follows from this that only a very small portion of the silicon has been reduced by manganese.

As is well known, a closer affinity exists also between carbon and manganese than between carbon and iron, and the effect of this circumstance may be plainly discerned from the analysis. While in melting steel poor in manganese a slight decrease of carbon is perceptible, manganiferous steel shows a large increase of it, caused by absorption from the crucible containing it.

THE ORIGIN OF GOLD IN CERTAIN VICTORIAN QUARTZ REEFS.

Mr. William Nicholas, geological lecturer at the Melbourne University and at the Sandhurst School of Mines, has read a paper before the Royal Society in Melbourne, entitled the Origin and Growth of Gold and Quartz Reefs or Veins in the Lower Silurian Rocks of Victoria. We quote from it as follows:

"Being deeply impressed with the idea that the 'laminated' quartz reefs are, for the most part, simply transmuted slate-beds, I looked for an explanation of the presence of gold in these reefs. In connection with this subject, I need hardly say that Mr. Newbery's researches, which have been published in your Transactions and the Progress Reports of the Geological Survey of Victoria, have thrown much light, and they may be looked on as standard investigations for reference. He has obtained gold from the incrustations of steam-boilers fed with mine-water, and he said that the late Mr. Daintree found gold in mine-water. It was therefore quite evident that mine-water was also the source of the gold in quartz reefs. Mr. Newbery remarked that organic matter has long been known as an agent for precipitating gold in the metallic state from its solutions, and the conclusion I came to was, that the organic matter in the soft black carbonaceous slate, when this slate was decomposing and changing into quartz, became both the precipitant and nucleus for the extraction of gold from the mineral waters that circulated in the tracks and reefs. I think the black slate, however, contained gold originally apart altogether from the mineral waters; for it is well known that 'casing' slate is frequently very rich in gold, and that too sometimes in very little altered or firm slate rock.

"'Casing' slate is now, as a rule, sent to the batteries to be crushed with the quartz from the reefs. I communicated my ideas on the origin of quartz reefs and gold to Mr. Mica Smith, B.Sc., of Sandhurst, who very kindly offered to make gold solutions for me with which to test the value of my ideas by experiments; and the following are the results of those experiments up to date: No. 1. (Strength of solution, 1¼ grains of metallic gold to 1 ounce.) Quantity of solution, 2 ounces of distilled water. In this solution, I placed a cube of galena and some soft black carbonaceous slate which I obtained from the Garibaldi mine, New Chum Reef, Sandhurst. Within twenty-four hours, gold was precipitated on the top edge of the cube of galena, and most plentifully on the black slate, and the next day I observed the whole side of the cube was covered with gold. On the black slate also, gold particles were visible, and just beneath its surface a thin layer of gold had begun to accumulate. I noticed, too, that action had apparently been to a great extent transferred from the galena to the slate. This experiment was begun on May 19th, and I may mention that it was carried out in a glass stoppered bottle from which the stopper had not been removed. Further, so as to assimilate my experiment as closely as possible to nature's conditions, I placed the bottle in the dark. On June 11th, a white spot made its appearance, through its lifting up some of the slate and gold. On the 16th, no change was visible excepting the enlargement of the white substance which swelled upward and spread outward. The body of the mass of slate also appeared to be showing a disposition to become white. This white

substance proved to be quartz. A doubt, however, existed whether this quartz was not enveloped in the slate put in the bottle; and must be verified by other experiments before this production of quartz can be announced. No. 2. This solution was identical with that of No. 1, with the exception that I added to it 2 ounces of mine-water, thus reducing its strength by one half. In this solution, I placed two bits of hard black slate taken from the same sample of slate as that used in No. 1. This experiment was begun on May 27th. It was then placed in the dark, and I found on my next looking at it on June 3d that both pieces of slate were covered with a bright gold. On June 10th, this gold coating became of a dull brown color, but bright gold was still visible. On this date, I placed two pieces of hard sandstone in the same solution. On the 24th, the condition of the slate remained unaltered, and the sandstone had deposited on them a few tiny brown spots and what appeared to be pin points of shining gold—doubtful. I also noticed two tiny white spots on one sandstone and one on the other.

"No. 3. Having ½ drachm of the solution of gold left, I placed this quantity in a bottle with two ounces of mine-water on May 27th, and added to it a little fine black slate, I did not observe any change in the experiment until June 24th, four weeks after, when the slate which was lying on one side of the bottle was swelling upward and gold was precipitated on its surface. No. 4 solution same as No. 1, excepting by addition of mine-water. Fine black slate was placed in the bottle sufficient to cover the whole of the bottom to the depth of a quarter of an inch. In a fortnight, a flocculent white substance had formed in the solution and settled around the sides of the bottle in white flakes; the whole of the surface of the slates was covered by a brown deposit in which gold can be seen. It is also visible in the overlying brownish white flaky deposit. In cavities formed by one or two bits of slate resting against the side of the bottle, gold can be seen attached to the black slate. No. 5 solution same as No. 4. In this, I placed sufficient large and small bits of calcite (carbonate of lime) to cover, or nearly so, the bottom of the bottle, which consisted of crystals of calcite got from Victoria Reef, Sandhurst; the mine-water used in Nos. 4 and 5 came from the City of Sandhurst mine, Hustler's Reef, Sandhurst. A disposition in the bits of calcite to turn purple is manifest. The solution still retains its bright yellow color, and a light brown deposit has settled on the calcite.

"No. 6. A cube of galena was placed in this, which has turned to a black-brown color, and to its edges are attached floating dark-brown dendritic forms. Solution, colorless. No. 7. In this, were placed three pieces of arsenical pyrites, got from Hustler's Reef, Sandhurst. Decomposition set in strongly; nearly all the yellow color had left the solution, and brown shadow-like deposits had formed, the specimens were coated with gold, and a few dark dendritic forms floated attached to their angles Gold adhered to the glass near the specimens, and the shadows continued to increase in a ray or star-like form. No. 8. In this was placed finely powdered black slate, carefully examined to prevent any bits of quartz being placed in the bottle. In three days, all the gold was precipitated, and the solution was colorless.

"'However little insight this paper may give as to the origin of laminated or banded lodes in other countries, I trust I have at least produced sufficient facts to warrant me in concluding that Victorian auriferous laminated quartz reefs are simply altered auriferous carbonaceous slates or clayey sandstones, and that through this transformation some of the gold in reefs was obtained by precipitation from the pervading mineral waters. Thus quartz and gold were formed by one operation in nature."

DREDGING AT OAKLAND HARBOR, CALIFORNIA.

At the last meeting of the American Society of Civil Engineers, a paper was read by Mr. L. J. Le Conte, Mem. American Society of Civil Engineers, describing the dredging operations at Oakland Harbor, Cal. The work described was the excavation of a tidal basin, and the deposit of the excavated material on the adjoining salt marshes. The machine used was a pump-dredge with a cutting apparatus consisting of a horizontal wheel with ordinary plows upon its lower face. The rotation of this wheel makes the excavation. Over this cutter and partly surrounding it is a hood, which allows water to enter only from beneath. Over the top of this hood a 20-inch pipe leads up to the large centrifugal pump of six feet in diameter. From this, a line of wrought-iron pipe, supported partly on pontoons and partly on the marsh, extends several hundred feet upon the tract to be reclaimed. The material, after leaving the cutter, is taken up by the water, passes through the pump and through the pipe to its place of deposit, without at any time during the transportation coming to a state of rest. The engines are two 16 by 20-inch engines, used exclusively for driving the centrifugal pump, and two 12 by 12-inch engines for driving the cutting apparatus, swinging the gear, etc. The steam is supplied by two 100 horse-power boilers, generally carrying from 90 to 95 pounds of steam. The amount of material transported with the water runs at times as high as 40 per cent by volume, but experience has shown that, in the material excavated at this point, which is a blue clay mud, it is not advisable to carry more than 15 per cent, particularly in order to secure a uniform distribution at the place of deposit. The total quantity moved by one dredge in eight months was 250,000 cubic yards. The best work in one month was somewhat over 60,000 cubic yards in 230 engine hours; the average distance of transportation being 1100 feet. The greatest distance transported was during October, when 45,000 yards were deposited in 190 engine hours, through from 1600 to 2000 feet of 20-inch pipe. The average daily expense account was stated as approximately $102; but this did not include the cost of the nine or ten men on shore, employed to secure a proper disposition of the material, particularly as the fill approaches completion, nor did it include the cost of retaining-embankments where required. The result of the work was stated to be, with this one pump-dredge, an average of 30,000 cubic yards, measured in the cut at a maximum cost of 10 cents per cubic yard, and in one particular month of 23 days' work, 60,000 cubic yards were deposited on shore at a distance of from 1600 to 2000 feet from the dredge, at a cost of 5 cents per cubic yard. The complete distribution of the material at the place of deposit has been very satisfactory, the result being a cluster of cones whose slopes are very flat—not more than 1½ per cent, and frequently so slight as to appear almost level.

THE LIABILITY OF A BOILER INSPECTION COMPANY.

Before the United States Circuit Court of the Eastern District of Pennsylvania, the case of Bradley and Wife *versus* the Hartford Steam-Boiler Inspection and Insurance Company involved the question of the liability of a boiler insurance company for damages for the loss of life occasioned by the explosion of a boiler inspected by it.

Defendant is a foreign corporation authorized to grant certificates of inspection and insure steam-boilers in the State of Pennsylvania. A certified boiler exploded and killed plaintiffs' child, and they brought suit to recover the value of its life (that is, the value of the child's service to them during his minority had he lived), alleging negligence in the inspection, the certificate granting an extent of pressure the boiler could not safely sustain. Defendant undertook to inspect Gaffney & Nolan's boilers at the corner of Mascher and Collins streets, and in accordance with the city ordinance. The *American Exchange and Review* has abstracted from the charge of Judge Butler to the jury as follows:

1. Did the certificate accord to the boiler a greater capacity of resistance than it would safely bear, thus authorizing its use under a dangerous degree of pressure? And if it did, then

2. Was this the result of negligent inspection?

The burden of proof respecting both questions is on the plaintiffs. You will first inquire whether the plaintiffs have shown that the boiler would *not* safely bear the certified pressure? They called before you several mechanical engineers as experts, some of whom testified, from investigations made after the explosion, that, in their judgment, the boiler-head would not safely sustain the pressure. Some of these witnesses, as the court understood them, did not unite fully in this judgment. This, as you observe, is the opinion simply of skilled and intelligent witnesses, who had no opportunity of examining and testing the head (the only part alleged to be defective) before the explosion. On the other hand, the defendants have called before you the manufacturers of the boiler, who testify, not only that the boiler was constructed of good material, and in the best manner as respects workmanship, but also that they subjected it to the hydrostatic test, and thus actually ascertained that it would safely bear a considerably higher degree of pressure than the certificate subsequently accorded it. The defendants' agents who inspected the boiler and granted the certificate testify that they also subjected it to this test, and ascertained it to be capable of bearing the pressure accorded with safety. The engineer who was first placed in charge testifies that, for the several weeks he ran the engine, the boiler sustained this pressure with safety. Several witnesses have testified that, with a view to ascertaining what pressure such a head would bear, a short boiler, with a head precisely like this, was manufactured after the accident, and subjected to the hydrostatic test, under the supervision of the city inspector; and that it actually bore between four and five hundred pounds to the square inch. The defendants also called experts, who, from the appearance of the boiler, expressed the judgment that it would safely bear the pressure certified.

The defendants were not insurers, as respects the plaintiffs. It was their duty to inspect and test the boiler, as has been explained to you. If the want or insufficiency of resisting capacity could be discovered by such inspection, they should have discovered it, and a failure to do so, under such circumstances, would be negligence. They were not required or authorized, however, to cut or chip the iron, and thus ascertain its quality, but to examine the boiler and its workmanship carefully and intelligently, and see whatever could thus be seen, and to subject it to the prescribed hydrostatic test. If they did this, and certified according to their best judgment thus formed, they are not responsible, no matter what latent defects may have existed.

Can you say that the boiler was subject to any defect discoverable by such an inspection? The head was of cast-iron, flat, with the flange turned inward. If such heads as you find this to have been were in common use, and thus approved by manufacturers and the trade, the defendants can not be held guilty of negligence in failing to condemn it, on this account. That such heads were in common use at the time, the testimony on both sides would seem to put beyond doubt. That other heads, of a different type, might be safer, or that experts differ in judgment on this subject, is unimportant. The defendants can not be found guilty of negligence in failing to condemn a head such as was in general use, and thus proved to be reasonably safe, or at least shown to be so esteemed.

The plaintiffs, however, contend, and have endeavored to prove, that this head, aside from its kind and material, was defective in manufacture—in that the man-hole plate, as they assert, was irregular, or uneven, on its surface, so that when bolted down upon the head, to make a close joint, it would strain the metal of the head; and in some other minor respects. While two, and possibly more, of the plaintiffs' experts testify to such defects of construction, others, and probably a larger number, of the plaintiffs' witnesses, who had an equal opportunity of examining the head, testify, either that they did not find these defects, or that they attached no importance to them. On the other hand, the defendants have exhibited the man-hole plate to you, and called witnesses, who, examining it in your presence, say it does not exhibit such uneven surface, and that it can not have been altered in this respect since the accident.

To the court, the exhibition of the plate, with this testimony, seems to be a complete and conclusive answer to the plaintiffs' allegation in this regard. You will say, however, whether it is so or not. Other experts called by the defendants tell you that there were no defects in the boiler-head, such as the plaintiffs ascribe to it, nor any other that a careful and competent inspector could have discovered. The City Inspector, Mr. Overn, called by the plaintiffs as well as the defendants, tells you distinctly and emphatically that no imperfection of any description could have been discovered in it before the explosion. He further tells you that he, as inspector, would certainly have passed it, and accorded the pressure certified; that the broken parts, examined by him after the accident, showed plainly that the explosion resulted from faultiness of the iron alone, which faultiness no previous inspection could have revealed. The defendants' agents, who inspected and tested the boiler, described to you how they did it; testify that they were careful in all respects; that they could discover no defect, and that it safely bore the prescribed test. The court sees nothing to justify the suggestion that these inspectors were wanting either in experience or intelligence.

Counsel for plaintiffs presented three specific exceptions to the charge of the court. Verdict for defendant.

A SUGGESTED CURE FOR BLAST-FURNACE CHILLS.*

By Henry M. Howe, A.M., M.E., Boston, Mass.

The object of the present paper is to suggest injecting into the hearths of iron blast-furnaces, whose temperature has become unduly lowered, some form of fuel whose calorific intensity under the peculiar conditions existing there is considerably higher than that of liquid petroleum, the use of this substance for melting out chills having grievously disappointed the high hopes which were at first entertained of it.

A chill being a fall of the temperature below that needed for the complete liquefaction of the slag, which requires, according to Plattner, about 1800 degrees C., one would suppose that the chief thing to be accomplished in curing it would be to raise the temperature in the crucible of the furnace. The most obvious ways of doing this seem to be to raise the temperature of the blast, and to increase the amount of fuel in the crucible itself. Simply increasing the rate at which the blast enters the furnace, if carried beyond a certain point, should lower the temperature in the crucible. The existence of a chill shows that the fuel is arriving too slowly at the tuyeres. If air be introduced so rapidly as to be in excess of that required for the combustion of the fuel, all that excess will simply lower the temperature around the tuyeres, carrying the region of intense heat upward, and weakening its intensity by increasing its size. Up to a certain point, increasing the rate of introducing the blast will increase practically *pari passu* the rate at which the fuel reaches the tuyeres. But when mechanical obstructions, which so often accompany chills, retard the descent of the fuel, there must be a point beyond which this does not hold good, and beyond which further increments in the rate of introducing the blast will not correspondingly increase the rate of descent of the fuel.

Up to a certain point, blowing on a match, a candle, or a fire will cause it to burn more intensely; beyond that point, the more you blow, the lower will be your temperature, till finally your fire, your candle, or your match is blown out.

Apparently somewhat the same thing is liable to take place in the crucible of a chilling blast-furnace. But one would expect that any chill could be melted out if you could considerably increase the rate at which both the fuel and the blast reach the tuyeres, provided that their combustion yields heat enough to raise its own products to a temperature well above the slag melting-point. This should be the more readily effected if the rate of arrival of the blast and fuel be increased in a higher ratio than the rate of arrival of the ore and flux.

FUEL AND CONDITIONS.	TEMPERATURE REACHED BY PRODUCTS OF COMBUSTION.	
	On complete combustion to CO_2 and H_2O.	On subsequent reduction to CO and H.
Pre-heated petroleum vapor, after Dulong's law, taking calorific power of C. at 11,214.....	3,950° C.	2,511° C.
Cold liquid petroleum.....	2,845	1,761
Pre-heated petroleum vapor, assuming its calorific power to exceed that of cold petroleum by its sensible heat above 100 degrees C., plus total heat of evaporation at 100 degrees C.....	3,050	1,737
Acetylene.....	3,840	2,474
Fine anthracite blown through tuyeres.....	3,389	2,114
Incandescent anthracite reaching the tuyeres in the normal way....	3,404	2,182
Ordinary producer-gas.....	2,379	1,265

Apparently the liquid petroleum has not in general yielded a temperature far enough above the slag melting-point to produce the desired effect, and I think that a little reflection explains clearly why it has not, and suggests the use of some other forms of fuel. I believe that much at least of the disappointment has been due to the kind of fuel injected, to its high percentage of hydrogen and low calorific intensity; and that a fuel of higher calorific intensity would in many cases have accomplished what the petroleum failed to effect.

In the first place, as the petroleum is injected cold and liquid, a great amount of heat is at once consumed in heating and subsequently in gasifying it. The amount of heat thus consumed is so great that the remainder of the heat generated by the combustion of the petroleum is not sufficient to raise the products of that combustion to the slag melting-point, except in the very small region where they remain unreduced from CO_2 and H_2O to CO and H.

Just how great the total heat of evaporation of ordinary petroleum is, I can not say, but there can be no doubt that it is very considerable. Mr. Joshua Merril, an authority in such matters, informs me that, from his prolonged experience, he considers it at least as great as the total heat of evaporation of water at 100 degrees C. Assuming it at this figure, pre-heated vapor of petroleum should raise the products of its own combustion in the blast-furnace to a temperature some 176 degrees C. (307 degrees F.) higher than cold liquid petroleum would.†

This seems to be about the lowest value we can assign to the difference between the temperature produced by the combustion of cold liquid petroleum and that produced by pre-heated petroleum vapor.

Now, although the bituminous coals have calorific powers considerably in excess of those which Dulong's law‡ would assign them, that of petroleum is much lower than this law would imply.

This may be explained as follows: Dulong's law employs the calorific power of *solid* carbon, but of *gaseous* hydrogen. Now, if we regard the bituminous coals not as strictly solids, but as merely extremely viscid liquids, like the bitumens into which they shade, the calorific power of their carbon should be greater than that of solid carbon, while that of their hydrogen should be less than that of gaseous hydrogen, the difference corresponding roughly in the first case to the latent heat of liquefaction of solid carbon, and in the second to the latent heat of gasification of liquid hydrogen. On this view, the ratio of the actual to the theoretical calorific power should increase in the case of liquid and subliquid hydrocarbonaceous fuels with the percentage of carbon they contain; and this is the case, roughly speaking, the actual caloric power being much greater than that calculated in the case of the coals, and much less in that of the petroleums.

If, as I believe, this is the true explanation of the low actual calorific power of liquid petroleum, we may conceive that gasified petroleum might have a calorific power approximating that which Dulong's law would give it, using in that law the calorific power of gaseous carbon, 11,214, instead of 8080, that of solid carbon to which this law was intended to apply. On these suppositions, the vaporized petroleum should yield in the blast-furnace a temperature nearly 100 degrees C. (1800 degrees F.) higher than cold liquid petroleum would.

This supposition is undoubtedly extreme, and it seems probable that the temperature attained with our pre-heated petroleum vapor will be somewhere between that just given and that previously assigned it, on the supposition that the total heat of evaporation of petroleum equals that of water. The temperatures corresponding with these two sets of suppositions are given in lines 1 and 3 in the accompanying table.

The preceding statements suppose that the CO_2 and H_2O produced by the combustion of the petroleum are completely reduced to H and CO within a short distance of the tuyeres. The researches of Ebelman show that this reduction took place within 17 inches of the tuyeres in a furnace in normal working. But, as in our case, the chemical composition of the two fuels (and hence of their products of combustion) is identical, the less complete is this reduction, and the more CO_2 and H_2O remain unreduced, the more will the temperature produced by pre-heated petroleum vapor exceed that produced by cold liquid petroleum.

Thus, to repeat, if the products of combustion be completely reduced to CO and H, cold liquid petroleum can not of itself produce a temperature as high as the slag melting-point, even if no heat be lost by radiation and conduction; but pre-heated gaseous petroleum can raise the products of its partial combustion higher, perhaps only to the slag melting-point, but perhaps much beyond it, according to the calorific power which we assign to it.

Now this difference between the temperatures attainable with liquid and vaporized petroleum may well enable the latter to succeed where the former fails.

It may be objected that in distilling the petroleum we may materially lower the proportion of C to H which enters the furnace, since many of the hydrocarbons which arise from its distillation are split up by heat, yielding portions of solid C, which may remain in the retort. To minimize this separation of C, the petroleum should be very rapidly distilled, and as rapidly withdrawn from the retort. To understand this objection, it must be remembered that in burning the petroleum it is only the combustion of its C to CO that creates a net gain of heat in the crucible of the furnace. The H, though burned at the tuyeres to H_2O, is immediately reduced to H by the surrounding fuel, its reduction abstracting as much heat as was produced by its combustion, so that it really adds no more heat directly to the crucible taken as a whole than so much N would.* Furthermore, by its great specific heat, more than ten times greater than that of any of the other substances in the furnace, it has a powerful effect in dragging down the temperature. It seems clear, therefore, that, for the purpose we are considering, H is a far less desirable element than C, and that *cæteris paribus*, the smaller the proportion of H to C in the fuel, the better.

But the proportion of H to C in the vapor differs greatly during different stages of the distillation, and, by diverting the vapors which pass over during the early stages when they are richest in H, and blowing into the furnace only those richest in C, we may hope to bring the average proportion of H to C in our petroleum vapor considerably below that which exists in the original petroleum. This would produce a temperature still further in excess of that attainable with cold liquid petroleum than has been already indicated, and perhaps even approximating the excessively high point reached by the products of combustion of acetylene, given in the fourth line of our table.

The same thing would be accomplished by gasifying and injecting the heavy crude oils produced in refining petroleum, which are much richer in carbon than the original petroleum is. Indeed, even if these oils were introduced cold and liquid, they would produce higher temperatures than liquid petroleum would.

The calorific powers of three of the gaseous hydrocarbons, marsh-gas, olefiant gas, and acetylene, have been actually determined. The proportion of the actual to the theoretical calorific power, calculated by Dulong's law, is by far the greatest in acetylene (the richest in carbon), and much the lowest in marsh-gas (the richest in hydrogen). Analogy would lead us to expect correspondingly high actual calorific powers in the other hydrocarbons which are rich in C.

Another consideration points in the same direction. In addition to their needing higher temperatures, it is highly probable that these hydrocarbons, rich in C, require a greater amount of heat for their distillation than those rich in H. This means that their latent heat of gasification is greater, and hence that the excess of their calorific power in the gaseous state over that in the liquid state is also greater than in the more easily volatilized compounds rich in H.

The fact that the proportion of the real to the theoretical calorific power is greater in the hydrocarbons rich in C than in those rich in H would further reinforce the already very strong probability that, with the former class of fuels, a much higher temperature will be reached than with the latter, by the products both of complete combustion to CO_2 and H_2O, and of the subsequent reduction to CO and H; and it increases the difference we may expect to find between the temperatures attainable with these two classes of hydrocarbons.

* Read at the Boston Meeting of the American Institute of Mining Engineers, February, 1883.

† The assumptions on which this and the subsequent statements concerning the temperature produced by combustion are based are given in full in an appendix. The details of the calculations are given in a second appendix.

‡ Calorific power = $8080\ C + 34{,}462\ (H - \frac{O}{8})$.

* It, however, indirectly contributes to the heat in the crucible. For every portion of H, as well as of C, thus introduced, we have a corresponding portion of combustible gas added to the gases issuing from the throat, which, by its combustion in the hot-blast stoves, adds to the heat of the blast.

Let us take the case of acetylene, whose behavior analogy leads us to expect that that of the hydrocarbons of similar composition would resemble. Not only is it very lean in H, having only 7·69 per cent, while crude petroleum has about 15 per cent, olefiant gas 14·3 per cent, and marsh-gas 25 per cent, but it is exceedingly stable, parting with its carbon slowly and only at a high heat. Moreover, it has an exceedingly high calorific power. While crude petroleum has actually 85 per cent of the calorific power which Dulong's law would assign to it, olefiant gas 81·8 per cent, and marsh-gas 76·8 per cent (for the latter two compounds substituting the calorific power of gaseous carbon 11,214 in place of that of solid carbon 8080), acetylene has 92 per cent and 118 per cent respectively, as we assign to the calorific power of C in Dulong's law 11,214 or 8080 units.*

So great is the calorific power of this gas that it would be capable of raising the products of its complete combustion by air to 3840 degrees C.; and even after being reduced to CO and H by the incandescent fuel in the blast-furnace, they should reach a temperature of 2474 degrees C., nearly 700 degrees above the slag melting-point, and nearly 900 degrees C. (1620° F.) above that attainable with cold liquid petroleum. Acetylene is readily produced from petroleum, which, indeed, seems to be its most economical source.

But we may obtain a still lower ratio of H to C by employing another class of fuel. If finely powdered anthracite, coke, or charcoal could be introduced into the crucible in large quantities, it would raise the products of its combustion to a temperature far above that attainable with pre-heated petroleum vapor of the composition of crude petroleum, and very nearly as high as that which is developed by the combustion of the incandescent fuel which is charged at the tunnel-head and reaches the tuyeres in the normal way. What this latter temperature actually is, we do not know. If all the heat were utilized in heating the products of combustion, and if the specific heats of the substance concerned were the same as at ordinary temperature, we should look for a temperature of about 3404 degrees C. on complete combustion to CO_2, and of 2182 degrees C. on the subsequent reduction to CO, were it not for dissociation.

The experiments of Bell show that the temperature of the slag, which roughly represents the average temperature of the crucible, is far above the melting-point of wrought-iron (say 1600 degrees C.), as a bar of that metal inserted in a slag as it ran from the furnace was rapidly melted, collecting in a basin farther on.†

Cailletet found that platinum, whose melting-point is estimated at about 2600 degrees C., melted rapidly at a point about seven inches in front of the tuyeres.‡

Of the three, anthracite, charcoal, and coke, the former should yield the highest temperature on account of its high calorific power, which is probably considerably above that which Dulong's law would assign it.

One can hardly believe that the mechanical difficulties in the way of introducing large quantities of finely-divided fuel are really insuperable. If they can be overcome, I can see no reason why this expedient should not enable the iron smelter to obtain a temperature in his crucible sufficient to melt out any chill or overhanging scaffold. One consideration inclines me to believe that such an introduction of extraneous fuel should be even more efficient in melting out chills and scaffolds than a partial breaking of a scaffold itself would be. If a scaffold is partially broken away, allowing the fuel, ore, and flux to fall into the crucible, as they were presumably charged several days before, and, indeed, before the chill occurred, they will simply arrive in the proportion needed for the regular working of the furnace. (Indeed, the very fact of chilling indicates that the fuel may not have been even in sufficiently large proportions for regular working.) That is, the fuel which is precipitated into the hearth will only be in sufficient proportion to heat and melt the ore which enters the hearth with it, and, by making up for the losses by radiation, conduction, and convection, to prevent the temperature from falling. But there will be no excess of fuel to perform the extraordinary work of raising the already lowered temperature, and of heating and melting large masses of chilled and solidified matter. Our extraneous fuel, however, injected directly into the crucible, not being accompanied by any other matter which absorbs heat in being heated and melted except the blast, generates an abundance of heat which is at liberty to raise the lowered temperature around it, and to heat and melt obstructions. All the heat it generates over and above that needed for raising the products of its own combustion above the slag melting-point is directly available for overcoming the chilled condition of the furnace.

Ordinary producer-gas, if made from anthracite, coke, or charcoal, consists almost wholly of N and CO, with a small amount of CO_2. This gas, introduced into the blast-furnace, could yield no net gain of heat from chemical action: although its CO would be oxidized to CO_2, it would be immediately reduced to CO again. Hence it is not suitable for introducing into our crucible. If the gas were made from bituminous coal, it would be but little better; it would then, indeed, contain a small amount of unoxidized C combined with H, whose combustion to CO would yield some heat, but far from enough to raise to the slag melting-point the immense quantities of inert CO,H and N accompanying it.

The most beautiful way of suddenly raising the temperature of the crucible would be to increase the proportion of O in the blast. The great amount of N in the blast has a most powerful effect in dragging down the temperature, forming, as it does, the great bulk of the products of combustion. Here, as in so many other operations of metallurgy and industrial chemistry, the discovery of an economical means of producing oxygen, or of even slightly increasing the proportion of oxygen in the air, will be an incalculable boon.

To sum up: cold liquid petroleum and ordinary producer-gas, far from having heat to spare, do not generate enough heat to raise the products of their combustion and subsequent reduction to CO and H even as high as the slag melting-point. A somewhat higher temperature should be reached by injecting the crude heavy oils produced at the refineries. Pre-heated petroleum vapor, on the other hand, especially if the proportion of H it contains be materially diminished in either of the ways indicated, is not open to this objection; and finely-divided anthracite, coke, and charcoal would yield a very great excess of heat over and above this requirement.

* Based on Thomsen's determinations, Deut. Chem. Ges. Ber., vi., 1533.

† *Journal Iron and Steel Institute*, 1871, p. 298.

‡ *Traité de Metallurgie*, Gruner, p. 466.

DISCUSSION.

Mr. W. F. Mattes, Scranton, Pennsylvania: There is one point that I would like to call attention to: chills of this character are usually caused by scaffolding. The scaffold prevents a regular descent of fuel to the place in the crucible where it should do its work, and during the prevalence of the scaffold the supply of carbon in the hearth is much diminished, with the result that the proper reducing atmosphere is not maintained. Now it seems to me that the injection of vapor of petroleum into the hearth, in the manner proposed, will fail to supply the one condition that is absolutely essential, namely, an active reducing atmosphere at that point. It might answer to call upon the fuel to carburize the products of the vapor combustion, provided there is sufficient carbon before the tuyeres. But usually that carbon is lacking, and then the carburization will probably occur higher in the furnace, perhaps at the expense of the fuel at the critical point whence the mischief originated, and any good effects are likely to be merely local and not at the right place. If the obstructions at the boshes can be broken, chills in the hearth will rapidly melt away.

Mr. Howe: The notion that the introduction of carbon and hydrogen—be they gaseous, liquid, or solid—into the crucible will weaken the reducing action there, and so increase the tendency to rob the parts above of their carbon, is utterly untenable. It is an increase in the proportion of oxygen introduced, not of such powerful reducing agents as carbon and hydrogen that would weaken the reducing conditions.

Doubtless you should have a reducing atmosphere with your high temperature, but a little reflection shows that we may hope for both. As the gentleman says, if you keep your petroleum as petroleum, you get no heat from it; if you oxidize it to CO_2 and H_2O, it will not help your reducing conditions; but if you oxidize it to CO, you will increase both your heat and the strength of your reducing conditions. You will not increase the proportion of CO_2 in the crucible unless you increase your blast by an amount which is more than the equivalent of the petroleum injected.

The gentleman seems to agree with me that chill is due to the lack of fuel at the tuyeres, and he rightly says that, if the obstructions at the boshes can be broken, chills in the hearth will rapidly melt away. This is because fresh fuel will arrive there. Now I simply propose that, when you can not get fuel from above, you should force it in from below, and that you should use a fuel of high calorific intensity.

Perhaps he is confused by the idea that it is necessary to have solid carbon at the tuyeres in order to obtain an atmosphere of CO. The gaseous C and H of the petroleum also reduce CO_2 to CO. It is not necessary, as he fears, to call on the solid fuel to perform this reduction. If there should not be enough solid fuel in the hearth to accomplish this, which I consider most unlikely, then the unoxidized portions of the petroleum will reduce the CO_2 and H_2O produced by the complete combustion of the remainder. H and CO_2 can not coexist at these temperatures.

The obscurity and confusion disappear if we remember that the calorific effect and the effect on the chemical compositions of the atmosphere of the furnace caused by introducing petroleum vapor should be parallel with that of introducing incandescent fuel. Indeed, we may here regard petroleum vapor simply as a manageable form of carbon, diluted indeed with a little H, whose presence yields no net gain of heat, but serves to intensify the reducing conditions.

Mr. Mattes: With reference to reducing the products of combustion by unconsumed vapor, it may be noted, first, that as the oxygen supply is continuous with that of the petrolum gas when the latter is in excess, its combustion will yield carbonic oxide and probably steam, but not carbonic acid; and secondly, that the decomposition of the steam by unconsumed petroleum gas does not produce the same effect as if accomplished by incandescent fuel, because the gas does not carry the surplus temperature of the latter. After the reduction of the steam, we shall have a mixture of nitrogen, carbonic oxide, and free hydrogen, which is certainly a very desirable atmosphere if obtained in connection with high temperature.

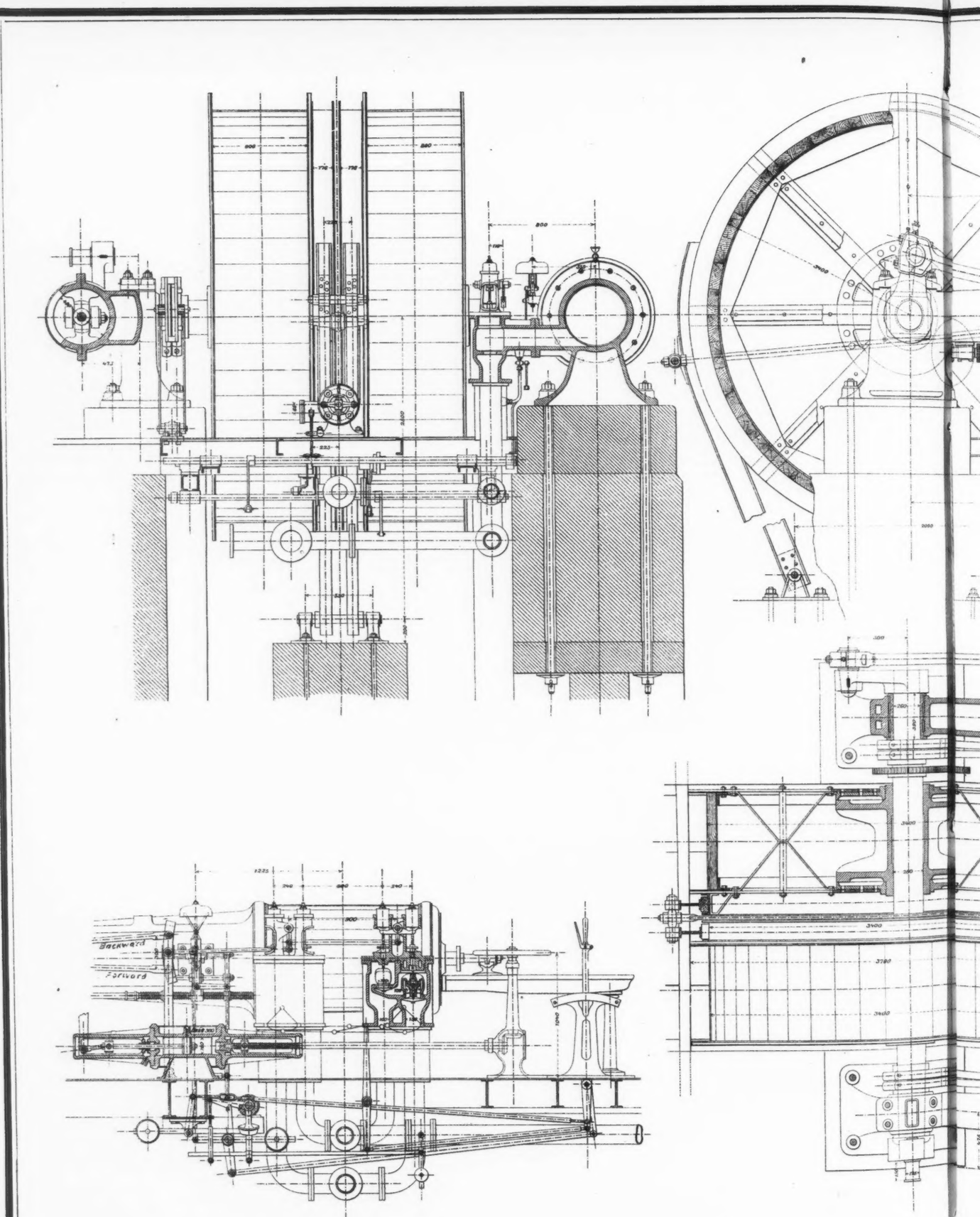
When, as sometimes happens, a scaffold or a fragment slips into the hearth with plugging effect, the obstruction must be directly attacked by the most available means. Under such conditions, a powerful blow-pipe jet will be a valuable agent, regardless of the composition of the products of combustion. But this treatment should cease when the immediate object is attained; otherwise, the trouble at the boshes may be aggravated and the second stage be worse than the first. When once the obstructions are sufficiently broken to bring within reach a body of incandescent fuel, no reagent is so safe and effective as the heated blast.

I had understood Mr. Howe's proposition to be the introduction of a mere jet of petroleum vapor to be oxidized by the blast of the tuyeres. Its introduction in excess is a different matter, and, if the heat calculations are correct, removes the chemical objection, while increasing the practical difficulties of its application. One of these difficulties is, to gauge correctly the relative percentages of gas and blast; and this will not be met by rapid analyses at the top, because they can not locate the reactions.

It may be interesting to note in this connection the frequent success that has attended an introduction of steam into the hearth for the purpose of breaking a scaffold. The usual method has been to introduce the steam into the blast-pipe before entering the ovens; but in a recent and very successful case, the steam-pipe (1 inch diameter, with ¼-inch nozzle) was carried to the nose of a tuyere and opened full to a boiler close at hand, with 115 pounds pressure, for two or three hours at a time. There is reason, however, to believe that, in every case where steam has proved efficacious, the scaffold-ring had closed rapidly, imprisoning a body of incandescent fuel below sufficient to decompose the steam without undue cooling; thus yielding, still at high temperature, a mixture strongly reducing and very penetrating.

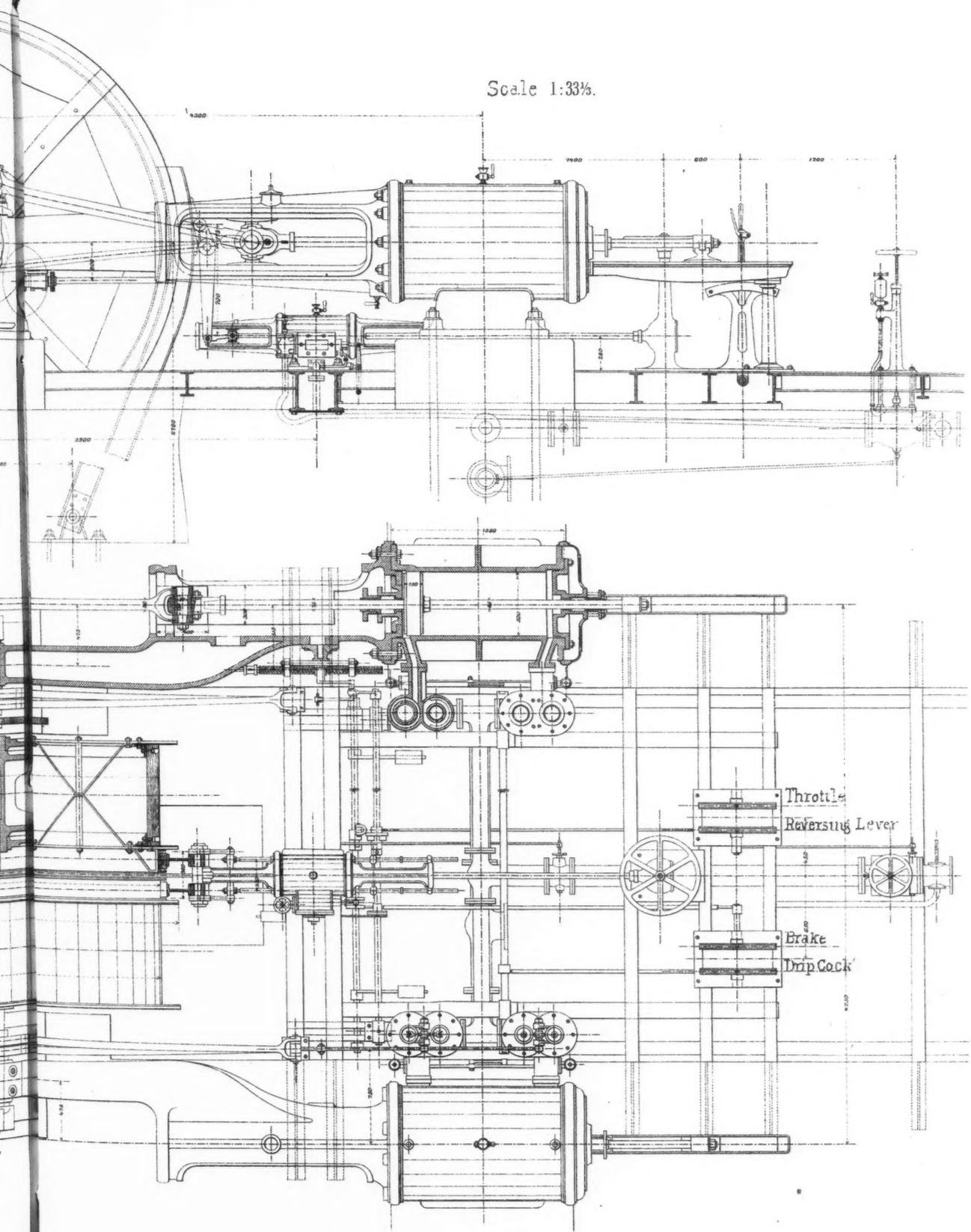
Mr. Howe: I do not know on what ground the gentleman says that petroleum vapor in excess will not produce CO_2 to be immediately reduced to CO: we know that solid fuel, no matter in how great excess, does yield CO_2, which is reduced by that excess.

The difference between the effect of the decomposition of steam by



THE HOISTING ENGINE OF THE B

Scale 1:33⅓.



F T BINDWEIDE MINE, GERMANY.

incandescent fuel and by red-hot petroleum vapor is much less than might be supposed. If we admit a difference of 500 degrees C. in the temperature of the solid and the gaseous reducing-carbon, that 500 degrees would produce only a difference of some 40 degrees C. in the temperature of the resulting products of combustion, so small a proportion does the weight of the reducing C bear to that of the whole of the products of combustion.

While I do not pretend to say that plenty of practical difficulties would not arise on attempting to carry out such a scheme as I suggest, yet I do not think that one of them will be that which Mr. Mattes has specified—gauging correctly the proportions of gas and blast. While, as I have said, you can have an excess of blast, you can not have, in the ordinary working of a furnace, an excess of fuel, because the fuel will only descend to the tuyeres as fast as it is burnt there; you can not make it descend faster. So injecting our petroleum will retard the descent of the solid fuel by consuming a portion of the blast and leaving so much less for the solid fuel. But you can not get an excess of petroleum over blast into your crucible until the petroleum is in such enormous quantity that it consumes all the blast that enters, leaving none whatever for the solid fuel. To do this would require an amount of petroleum which no one in his senses would dream of injecting.

I can see no difficulty in the way of controlling operations by means of rapid analyses of the atmosphere in the crucible, drawing off samples through holes pierced in its sides.

Mr. R. P. Rothwell, New York: I would ask whether Mr. Howe has considered the use of the mixture of carbonic oxide, known as water-gas, for this purpose. The temperature of combustion is higher, if I remember the figures, than the temperature of combustion of vapor of petroleum, and it may be available here. We find it in similar uses in some other processes requiring high temperature. It is a cheap, economical fuel to procure or manufacture. I have nothing more definite than this mere suggestion to make, as I have not the figures at my command, but I believe its temperature of combustion is very considerably higher than that of petroleum or coal-gas.

In some recent experiments that have been made in Germany with this water-gas, they have injected the gas along with the air mixture, either combining it before injection or while it is being injected, and in that way they obtain an extremely high temperature. Whether it would be applicable to the case under consideration I can not say positively.

Mr. Howe: Water-gas consists mainly of CO and H, with small portions of N and CO_2. On account of its freedom from N, its complete combustion of air causes a higher temperature than either C or H. But its introduction into the blast-furnace can cause no net gain of heat there, since, though burnt at the tuyeres, it will be again resolved into its original condition by the solid fuel surrounding it, and the decomposition of the products of its combustion will consume exactly as much heat as was given out on its combustion. The oxidation and subsequent reduction, the generation and absorption of heat, would take place within such a short distance of the tuyeres that probably no useful effect is to be expected from its use. Indeed, as its initial temperature would be lower than that of the crucible itself, it would, in being raised to that temperature, absorb a certain amount of heat, and thereby lower the temperature of the crucible taken as a whole.

Mr. C. Constable, New York: I would suggest that when we speak of a furnace chilling we give the impression that the furnace is likely to go out. It seems to me that "chilling" is commonly, at the outset, the result of driving the point of combustion up into the furnace, and the word is perhaps a misnomer, since the combustion is still going on. Furnaces have been, of course, banked up for six months at a time, and have started off well again, making foundry iron. So that it is not very easy to put out a furnace, to chill it, provided air is excluded. The chilling is rather the apparent cooling of the hearth only, and because the burning-point has been merely driven higher up by an excess of air, as I believe. The hearth, like that of any furnace, is only capable of burning so much fuel per hour; and if an excess of air is blown in, it will burn the fuel that is higher up in the furnace, raising the heat on the boshes and rendering the stock sticky. The danger, then, is, that the stock may scaffold. If the original causes are not removed, the tendency at first to "hang" and "slip" becomes aggravated, and a permanent scaffold is formed, which, if bad enough, may put the furnace out, it is true. At this stage, Mr. Howe's plan may come in play. But when the first indications of the chilling of the hearth are met by a reduction of the revolutions of the engine (to suit the condition that less fuel is reaching it), and, where possible, by an increase in the heat of the blast, I think many of us have not only found relief, but have reduced the tendency to scaffold and chill. What I would call attention to is that, if taken in the first stages, as suggested, serious scaffolds, such as Mr. Howe is treating of, would seldom occur.

Mr. Howe: Doubtless some scaffolds and chills can be remedied in the way the gentleman advises, but many others can not. If you are scaffolded so that coal can not fall to the tuyeres, merely slacking your blast will not bring your coal down to the tuyeres, nor will it raise the local temperature.

If the amount of fuel arriving at the tuyeres in the unit of time is so small that its combustion (even when no excess of air is injected) does not generate enough heat to raise to the slag melting-point the amount of burden which arrives at the tuyeres in the same unit of time and to restore the heat lost by radiation, conduction, and convection during that time, then your furnace must chill and eventually go out unless you increase the rate at which the fuel arrives at the tuyeres, or raise the temperature of the blast, or otherwise increase the amount of heat in the crucible. If you can not bring more fuel in from above, bring it in from below, but gasify it outside your furnace, and do not lower the temperature of your furnace by gasifying your fuel inside it.

WITH the growth of the Western anthracite business, a matter is assuming greater importance to which some of our ingenious inventors should direct their attention. What is wanted is some machinery that will automatically load any kind of a railroad car that may come to the breakers, so that there will be no trouble in loading with hard coal grain cars returning Westward. There is a rich harvest in store for those who succeed in devising a really meritorious machine.

THE HOISTING-ENGINE OF THE BINDWEIDE MINE, GERMANY.

(WITH SUPPLEMENT.)

The engine of the Bindweide mine was designed to afford the means of hoisting the ore for an estimated period of working of twenty years from a maximum total depth of 286 meters, or 200 meters below the tunnel level, the capacity being 40 cars holding 13 tons of iron ore each, per hour. The work of the engine was to include also the hoisting of the coal for the boilers from the tunnel level to surface, and hoisting rock to surface to be delivered to the dump. The specifications called for direct-acting engine, with valve-gear. Cylindrical drums, 3·4 meters in diameter, were chosen. The steam pressure available was from 6 to 7 atmospheres. Taking the weight of the empty cars at 300 kilograms, the maximum load of ore or rock at 1300 kilograms, and the weight of the cage at 500 kilograms, then the maximum load on the wire rope at a point immediately above the cage would be 2·1 tons. In order to have a factor of safety of 10, a 25-millimeter round crucible-steel wire rope was chosen, the manufacturers claiming for it a tensile strength of 27,000 kilograms. Its weight was 1·8 kilograms per running meter, so that, at a maximum depth of 286 meters, the greatest load on the rope, including its own weight, will be 2·615 metric tons. The width of the drums was made 0·8 meter, and the dimensions of the steam-cylinders were made 0·5 meter diameter and one meter stroke. Assuming the useful effect of the engine to be 60 per cent when starting with only one cylinder at work, the other being on its dead-center, and taking the useful effect to be 75 per cent while hoisting, both cylinders doing their work, then the engine will be found powerful enough to start the work with one cylinder, and to hoist it with both cylinders, cutting off the steam at one quarter of the stroke. This is irrespective of any effort to counterbalance the weight of the rope. With a back rope, a pressure of five atmospheres would suffice to do the work. The Gooch valve-gear was adopted, and permits of cutting off at a range between 0 and 85 per cent of the stroke. The cut-off gear is not automatic, the engineer gradually varying it by means of a lever during the stroke. Indicator diagrams taken show that the engine is well designed. There is a slight defect in the admission of the steam, when the cut-off takes place at an earlier part of the stroke, which is due to the use of the Gooch gear.

THE TRANSMISSION OF ENERGY.—It is well known that the town of Geneva is about to erect large works on the banks of the Rhone, the waters of which they intend to utilize for distributing and supplying motive-power throughout the town. Before finally settling the method of utilizing the water-power, they appointed a committee to consider the matter. This committee was composed of MM. Legler, Achard, Pictet, and Turrettini. These gentlemen drew up a report in which they considered the various methods that might be adopted, and, among others, that based on the generation and distribution of electrical energy. One great obstacle to this method was, however, in their opinion, the loss that occurs in the distribution of electricity. "This loss," the report says, "is due to three prime causes: the heating produced by the resistance of the generator, the heating produced by the resistance of the cable, and the heating produced by the resistance of the receiver. These three factors, to which must be added the relatively small amount of friction in the two machines, are the principal cause of the loss of power, which must not be overlooked; for in the celebrated experiments of M. Marcel Deprez at Munich, and at the Gare du Nord, at Paris, they amounted together to about 70 per cent, thus leaving a useful return of 30 per cent only. It is but just to mention that M. Deprez had been pleased to exaggerate the difficulties in his experiments by employing iron cables and by trying to generate a difference of potential of several thousand volts in one machine alone, which rendered it very delicate, and reduced to a great extent the power obtained, owing to the insufficiency of the insulation of the wires of his machine in the presence of such colossal differences of potential. The distance to which M. Deprez transmitted energy was 8·5 kilometers. It is unlikely that in Geneva we should have to transmit so far from the generating station; therefore the problem is to a certain extent simplified." The report further considers that it would not be good to have a higher electro-motive force than 500 volts, in view of possible accidents to persons. For the present, therefore, there does not appear to be any chance of Geneva utilizing its water-power to generate electricity and distributing the latter. The report is in favor of the adoption of a system of transmitting water under pressure, to be utilized as required.

FURNACE, MILL, AND FACTORY.

The Colliau Furnace Company, of Detroit, Mich., has now in course of construction two of its largest size cupolas for the Frankfort shops of the New York, West Shore & Buffalo Railroad.

The converting works of the Scranton Steel Company averaged fifty-two heats per turn last week, a record which, so far as known, has not yet been beaten except by themselves.

The Norway Iron-Works, South Boston, will close its operations under the name of Naylor & Co. the 1st of January. The works were built in 1854 and completed in 1855 by Henry S. Washburn & Co., and shortly after passed into the hands of Naylor & Co., an English firm with agencies in several cities besides Boston. The place was built under the supervision of Hon. Thomas Gogin, and the extensive improvements carried on since that period have still been under his direction. He has been superintendent from the opening of the works up to the present time. The great specialties of the works are making steel boiler-plate, carriage-spring steel, and a general variety for cutlery. The open-hearth steel manufactured there is largly used at the South Boston Rolling-Mills to make boiler-plates. There has been an increased demand for wire the past few years, on account of the new inventions in electricity. A project is on foot to establish a joint-stock company. The Norway Iron-Works have always been a paying concern, and it is not on account of any suspension the proprietors retire. The money volume of the business at the works has amounted to at least a million and a half of dollars yearly, and for labor alone seven thousand dollars have been paid out weekly. Six hundred men are at work, representing three thousand persons, and the suspension of the business at the present time would prove a very serious matter. There are great inducements to capitalists and men of enterprise to continue the business, considering the easy facilities for delivering the raw material to the wharves and the remov-

ing of the same when manufactured. For the last year, experiments have been going on to substitute petroleum instead of coal. Some furnaces have been reconstructed for the use of this material with every success.

The Centralia Mining and Manufacturing Company, Centralia, Ill., has placed its order with the Lechner Manufacturing Company, Columbus, Ohio, for roller chain belting. This company has also made shipments of steel roller chain to the Montgomery Iron-Works, Montgomery, Ala., for traction engines; D. Giles & Co., Chattanooga, Tenn.; and the Ohio Pipe Company, Columbus, Ohio, for racking carriage on lifting cranes.

The Brier Hill Iron and Coal Company is making preparations to engage in the manufacture of dephosphorized metal. The spiegeleisen furnace built by this company is rebuilding under plans prepared by Edward L. Ford, of Youngstown, Ohio. The metal while heated to a liquid state in the blast-furnace is carried to the new furnace in ladles, and subjected to a certain process that removes the phosphorus, leaving only the pure metal, which is a very valuable product. Work is pushed on the furnace, and, if the weather continues fair, it will be ready for operation in a few weeks.

The Martel furnace, Mich., has blown out for the winter. The cause is said to be the depressed state of the iron market.

The Penn Iron Company, of Lancaster, Pa., has given notice to its puddlers of a 10 per cent reduction to take effect December 15th. It is probable that the works will shut down, as the workmen refuse to accept the reduction.

The Union Rolling-Mill at Cleveland, O., was almost destroyed by fire December 9th. The loss on the building is $20,000, and on the machinery probably between $50,000 and $60,000. The insurance can not be estimated.

The Mount Hickory Rolling-Mills were destroyed by fire December 9th. The loss is estimated at $200,000; insurance, $90,000.

At a meeting of the Toronto City Council, it was decided to grant a lease of a portion of the marsh lands for the purpose of aiding in the establishment of iron and smelting-works, for the term of forty-two years, at a rental of $1 per acre per annum, and that the real estate, plant and machinery be exempt from taxation for ten years.

The Scranton Steel Company has given notice of an increase of capital stock from $600,000 to $1,500,000. It is said that it has received a big contract, and the increase was necessitated thereby.

The large rolling-mills of Coates & Brothers, George, W. P., and Charles E. Coates, at Locust Point, near Baltimore, Md., have suspended operations. The suspension is attributed to the recent heavy failures in other cities and to the great depression in the iron trade during the past two years. Their liabilities are $175,000; assets, from $40,000 to $100,000. The firm promises to pay every dollar of its indebtedness. Two hundred employés are thrown out of work. The mills were built in 1882.

The Dickon Manufacturing Company, of Scranton, Pa., has reduced wages 10 per cent.

The Coosa furnace, at Gadsden, Ala., was burned December 9th. The fire was caused by one of the gas-blowers exploding near the furnace-shield. The latter is a total wreck. The engine, boilers, and 400 car-loads of coke were also destroyed. The loss is nearly $150,000, with no insurance.

About seventy mechanics, who have been discharged on account of slackness in the work from locomotive-shops in Paterson, will sail for Europe, to go to work at iron steamship building on the Clyde.

The Phillipsburg sheet-iron mill, which is considered the largest manufactory of the kind in New Jersey, after one week's idleness, started up again with a reduction of 10 per cent in wages, making a total reduction in wages within a month of 15 per cent. Nearly all of the iron mills through the Delaware Valley are making a like reduction. An overstocked market is given as a cause. The owners of mills say there will be little work done this winter.

The contracts for the supply of metallic label cases and printed wooden tags for the use of the Post-Office Department have been awarded to Charles R. Penfield, of Lockport, N. Y., and Smith, Egge & Co., of Bridgeport, Conn.

Nineteen creditors of Brown, Bonnell & Co., by their attorney and by consent of Brown, Bonnell & Co., entered judgments in the Common Pleas Court December 10th to the amount of $142,000. Executions were issued, but nothing further will be done until after a hearing before Judges Welker and Baxter, at Toledo, on December 17th, on a motion to discharge Receiver Gayette Brown, of Cleveland.

The rail-mills of the Albany & Rensselaer Iron and Steel-Works at Troy, which employ 400 men when busy, have shut down. General Marvin says the condition of the labor market does not admit of the running of the mills at present. The iron and merchant steel-works were running, though not at full capacity. The combined works employ, at full capacity, 3000 hands. Less than half this number are now at work.

From Pittsburg, it is reported that the rail department of the Pittsburg Bessemer Steel-Works at Homestead have been shut down, throwing 800 men out of employment. Andrew Carnegie stated that the Edgar Thomson Works, at Braddock's, which employ 3000 men, would probably follow suit in a week. McKee, Anderson & Co.'s mill, at Beaver, Pa., has also been closed, and will remain closed until after the holidays. The Manchester Iron and Steel-Works will suspend operations on account of scarcity of stock, and 150 men will be thrown out of employment. The puddling department of Kloman's Superior Mill, which suspended four weeks ago, will resume.

The Electro Metal Refining Company of this city, says the Rome, N. Y., *Sentinel*, has been engaged since last May in putting in a plant at the malleable iron-works, for the purpose of treating base bullion by electricity, and separating the lead in the bullion from the impurities. Mr. N. S. Keith, of New York, after years of study, has discovered a new mode of doing this work by electricity. It has been tried on a small scale and has been found to work successfully.

A part of the malleable iron-works building which has heretofore been used as a molding-room has been partitioned off for the purpose of constructing this plant. In this room, have been built 30 circular vats or tanks. These vats are made of a composition as hard as rock and rest on a floor of the same substance. Each vat is six feet in diameter on the inside and 40 inches deep. There is a core two feet in diameter in the center of each vat, extending from the bottom to the top. In the center of each core is a copper conductor for carrying the electric current from one vat to the next one, and so on through the entire series of 30. There are but a few inches of space between the vats. Within each vat, are 13 cylinders of thin sheet-brass extending from the top of the vat down two feet. These brass cylinders are in a nest, two inches apart, and range from two to six feet in diameter. These cylinders are termed the cathodes. The bottoms of the cathodes rest on a copper conductor through which the electric current passes. This conductor passes under the bottom of the next vat and up through the center core to the top. The cathodes can be taken out of the vat, and put back again whenever it is necessary. A clear space of about a foot is left in the bottom of the vat.

Each vat is provided with what is called an anode frame, similar in construction to the cathodes, being a nest of brass bands two inches apart. These bands are, however, but two inches in width. In the center, is a copper hub, from which arms or spokes extend, like the spokes of a wagon-wheel. Into three of these spokes, are set copper conductors, and to the conductors are riveted the brass bands which form the frame. In the copper hub, is a socket which sets on to the copper conductor that comes up through the core in the center of the vat. To each of the brass bands are attached small brass hooks which look like the heads of large pins. The vats stand between three and four feet high on the floor, and each one is covered with a heavy movable wooden cover. When these covers are all down, they form a large platform or stage over the entire series of vats. The covers are taken off and the cathodes and anodes lifted out of the vats by means of a traveling crane.

The base bullion is melted in a reverberatory furnace. On a circular revolving pedestal, are twelve molds. The bullion is run into these molds and forms plates two feet long by six inches wide and one eighth of an inch in thickness, and provided with two ears or loops. By the time a casting makes one half the circuit after being poured, it is cool enough to be taken out. With one man to pour and another to remove the plates, the casting can be done very rapidly. After the plates are removed from the molds, they are inclosed in muslin bags and hung by the ears or loops on the pins with which the brass hoops of the anode frame is provided. These plates weigh about eight pounds each. After the frame is full or loaded with plates, it is lifted by the traveling crane and carried to any vat required and lowered so that the plates hang between the cylinders of brass in the vat, and the copper hub of the anode rests on the copper conductor in the core of the vat. After all is in readiness, a solution is let into the vats, and the electrical current is started by means of an Edison dynamo that is in the building. By means of the copper conductors, the current is conveyed from one vat to another; that is, the copper conductor in the core transfers it to the anode frame by means of the copper conductors in the arms. It passes through the solution, acts on the plates, and passes off on the copper conductor to the next vat, and so on around the whole thirty and back to the dynamo, forming a complete electrical circuit. It is intended to start three vats a day for ten days. At the end of that time, the whole thirty will be in operation, and the first-three will be ready to clean up. If every thing works as is expected, three tons of pure lead will be taken out each day.

By means of a system of wooden pump-logs underlying the vats and communicating with each of them, the solution is forced into the vats from the bottom, overflows at the top, and is carried by conductors to a large cistern. Thence it is pumped up into an overhead tank situated higher than the vats, and from which the original supply comes. This tank is supplied with a copper steam coil, by means of which the solution is heated to about 100 degrees, when it overflows into pump logs by its own gravity and escapes into the vats to be used over again. This process proceeds uninterruptedly. By this means, a constant circulation of the solution and a uniform temperature are maintained. The solution is made of acetate of soda, sulphate of lead and water, and is kept at a density of about 10 degrees Baumé.

Power will be furnished by the malleable works engine, and the dynamo will make 1500 revolutions a minute.

The lead thus produced is pure, and can be used for purposes for which the article is in demand, such as white lead, paints, sugar of lead, and is especially adapted for the new system of storing electricity. This company has contracted all the lead it can manufacture to the American Storage Battery Company, at about $60 per ton above the quoted price of lead. The Electro Metal Refining Company has a capital of $100,000. The officers are as follows: President, N. S. Keith; Vice-President, Samuel Wardwell; Secretary and Treasurer, J. S. Wardwell. Among the directors are A. Ethridge, Edward Comstock, M. D. Barnett, C. O. Yale, and others.

GENERAL MINING NEWS.

ARIZONA.

PIMA COUNTY.

QUIJATOA.—J. W. Mackey and J. W. Flood, of San Francisco, have, it is rumored, purchased these mines. The sale was negotiated by W. Lytle, of the same place, who takes an interest with them. The price paid was $450,000. The mines are located eighty miles southwest of Tucson, and were discovered last May. The purchase was made on the report of J. N. Low, W. S. Patten, and Hank Smith, acknowledged to be the best authority on the coast. The purchasers will begin operations at once on an extensive scale, putting up the most approved machinery for developing and working the ore.

CALIFORNIA.

MONO COUNTY—BODIE DISTRICT.

BODIE CONSOLIDATED.—The official report for the week ended December 1st shows: Ore crushed, 120 tons; average pay value of pulp, $15.80 per ton; of tailings, $3.05. Bullion shipped, $6877.83.

STANDARD CONSOLIDATED.—For the same week, the report from this mine shows: Ore extracted and shipped to mills, 1419 tons; crude bullion received, 2346 ounces; bullion shipped, $16,324.50.

COLORADO.

BOULDER COUNTY.

Mr. J. R. Wood, of Boulder, sends us the following notes under date of the 5th: Owing to the continuance of the mild weather, mining in this county has not yet lost its summer impetus. Prospecting is still carried on upon the surface, as there is no frost in the ground where exposed for one or two hours during the day to the sun. The miners in the gulches upon Four Mile Creek are still doing some work, but expect to be closed down by cold any day. This gulch has been worked steadily for the past fourteen years, and a number of claims have paid handsomely. The work is necessarily slow, as, owing to the large amount of heavy boulders and lack of dump-room, a hydraulic can not be used. During the last two years, most of the work has been done by Chinamen under lease. As the cañon is narrow and is now occupied by the Greeley, Salt Lake & Pacific Railroad, a large amount of good ground can not be worked. Six miles from Boulder and one mile from the station at Crisman, are located the Yellow Pine mines, owned by Mr. George Williamson, by whose courtesy we were enabled to make a thorough examination, and were agreeably surprised at the showing of ore and the amount of development-work done. With the main working level at an altitude of only 7000 feet above the sea, the various tunnel-mouths one hundred feet above one another open into the hill-side, until, at the discovery-shaft, we are 800 feet above the lowest working, while the mountain still ascends at an angle of 45 degrees 300 feet higher, admitting all the work to be done through tunnels, shafting being only necessary for ventilation, and nowhere need more than 100 feet be sunk or raised to connect any two succeeding levels, thus doing away with all expensive machinery in handling rock or water. The property consists of the Yellow Pine, Volcleuse, Duroc, Gray Copper, and Mitchner lodes, and has been opened by 4955 feet of tunnels, connected by 912 feet of shafts. No stoping has been done to speak of, the owner's working plan being, "as long as the work of exploration pays for itself, no stoping will be done." In every tunnel, we found large blocks of ground from 100 to 200 feet long by 100 feet in hight, carrying a mineral streak of from one inch to five feet of ore, averaging 300 ounces of silver per ton, while the sorters were saving one grade as high as 800 ounces. The pay-streak in the Yellow Pine vein is from two to five feet in width. An average sample from the widest part gave 275 ounces. The ore apparently lies in a chimney whose dip is to the northwest, and as each succeeding tunnel has reached it, the ore-body maintains its quality and strength. The east wall, upon which the ore lies, is perpendicular, and wherever opened carries a regular northeast and southwest course, and as yet has shown no break. English, Welsh, and American miners with whom I have talked say they never before saw so fine a wall. Some cross-cutting has been done; but as yet the other wall has not been found, although bunches of ore and small feeders are encountered for thirty feet. Thirty men are steadily employed, and as the vein-matter is soft, a large amount of development is accomplished monthly. In the immediate neighborhood of the above mines, is the Five Brothers, a tellurium-bearing vein, which is worked by five men under the direction of Mr. E. McCormack. Not much ground has been opened yet, but the work has paid well as far as prose-

cuted. The Rob Roy, an extension claim upon the Yellow Pine vein, is worked through a cross-cut tunnel now in 100 feet. Another vein carrying a paying body of silver-bearing ore was cut at 80 feet, and is now opened by two headings from the tunnel, while the tunnel-breast is pushed by two shifts of men. The Neikirk concentration mill, at Crisman, after four years of continuous work, is undergoing preparations for putting in a new concentrator, the invention of a Boulder man. Although this machine has been at work in the county for about two months, and when seen by us appeared to be making a close saving of the mineral, still the operators could not be got to make a thorough test so as to ascertain the actual saving, appearing to be satisfied with what they could see. We hope that this may now be arrived at, as the cost of the machine is not more than $500, and the power used only one half horse, with a capacity of 15 tons daily. As the greatest want of the miners of Colorado is a concentrator having the requisites of economy in construction and power used with large capacity, we watch with deep interest any machine that promises to meet the conditions.

Work is steadily prosecuted on the Melvina lode by a force of 15 men. So far, it has been found necessary to employ the full force in replacing timber and putting the mine into shape for safe working, as the action of the water while standing idle had done a large amount of damage, the walls being soft. Enough ore was found in the old workings to nearly cover the expense, and new ground is now opening.

The concentration-works of the Century Company, at the mouth of Gold Run, continue steadily at work, treating 15 tons a day. The company is putting in tables to amalgamate the ore before it goes to the concentrators. The record shows a saving of 97 per cent upon some ores, with an average of 85 per cent. Work is about to be resumed on the Hoosier Tunnel. As this is a strong vein, some 60 feet wide, which has paid at times, it is expected that further explorations will open another ore-body.

The Victoria lessees are about purchasing a No. 8 Cameron pump, and on its arrival will sink the main shaft 200 feet deeper. In doing the annual work upon the Valley Forge, a body of ore giving mill-runs of 2000, 3000, and 4000 ounces was encountered. But for some reason, the mine immediately closed down. As this was done before the extent of the ore had been determined, the trouble is not in the vein.

CLEAR CREEK COUNTY.

PAY ROCK.—During the past two weeks, the superintendent has put 65 new lessees at work on the Pay Rock, in addition to the large force previously employed. The pumping out of the shaft below the tunnel level has opened up again for mining 1000 feet of levels, which will be rapidly extended. Two pumps, a sinking and a No. 5 Knowles, were used in cleaning out this shaft. The old stull timbers kept their place well. In No. 3 level, a scale caved off one side, disclosing about four inches of 600 or 700-ounce stuff and 15 inches of ore running from 70 to 80 ounces. Larger masses of ore are now to be seen in the mine. Its output this winter promises to be much increased.

DOLORES COUNTY.

PHŒNIX.—Some more fine ore has been found. It is not a new body of ore, but is merely a continuation of the mineral on which they have been working. It is bromide in character, and it is thought the whole body will run high. Tests made have run very high.

GUNNISON COUNTY.

Gunnison City is enthusiastic over the prospect of several new smelting establishments to be built in that vicinity early next year. Mr. S. D. Patrick left Denver for Alma to superintend the removal of the Stevens furnace from that section to Gunnison City. The Stevens process has not had success in Colorado thus far, although it is claimed to have worked in a satisfactory manner in Utah and Omaha under thorough test.

The mines at Spring Creek are fully meeting all expectations, and a number of good producing properties have been opened during the past year.

The Von Cota lode, located only last June, by a limited amount of exploration-work disclosed three and a half feet of lead carbonate ore, containing fifty-two per cent of lead and twenty-two and a half ounces of silver to the ton.

The James lode shows a fair body of ore, carrying sixteen ounces in silver and from forty to fifty per cent in lead. The mine is located on the south end of Bald Mountain.

The Boston lode, on Ute Mountain, is owned by a number of Leadville gentlemen. The workings expose quite an ore-body running seven ounces in silver and seventy per cent in lead.

Excellent ore-bodies have also been opened along Oaio Creek and the White Pine District, the mines of which are owned principally by Leadville gentlemen.

The Doctor mine is shipping regularly to the smelting-works near Salt Lake City, a distance of 460 miles.

HINSDALE COUNTY.

HOTCHKISS.—The tellurium streak in the formerly famous Hotchkiss mine, the riches of which led to the establishing of Lake City, has been struck again, after years of idleness and litigation. The mine was re-located as the Golden Fleece, and is owned and patented by Samuel Wendel and George Wilson. A contract had been let to extend the lower drift, and work had just been commenced when at 240 feet the ore-body was struck. It extends from top to bottom in the face of a drift, and is improving at every shot. The ore-body is a foot in width, with tellurium and petzite freely interspersed.

LAKE COUNTY.

ÆTNA.—The lessees of this mine on Carbonate Hill have begun hoisting mineral. They have between $9000 and $10,000 worth of ore broken and ready to fill into the bucket, with assays from the different stopes ranging from 37 to 400 ounces per ton.

CHRYSOLITE.—Drifting to the south and east from the All Right No. 2 shaft is advancing at a satisfactory pace. The south drift will soon be connected with the Kit Carson No. 2 shaft, and thence will be continued to the Eva No. 5, which is already connected with the principal workings of the mine. The driving of the Iron incline is also making good progress. Work on the Chrysolite No. 6 shaft will begin soon. It is situated back of the office buildings. This shaft was begun by W. S. Keyes, while manager of the property, several years ago. The shaft has a depth of 152 feet.

CROWN POINT.—Exploration and development-work at this mine, on Rock Hill, has been advancing very satisfactorily. The extension of the underground workings of the mine broke into the drift of the La Plata mine, on the territory of the Pinnacle lode. In driving this work, a large body of ore was opened, running twenty-five ounces in silver and thirty-five per cent in lead. The extraction of ore and shipments in large quantities will begin at once. The hoisting-plant that is being placed on the Crown Point shaft, a new shaft-house, ore-bins, and other surface improvements are also under way.

FRYER HILL.—Only three furnaces are in blast at these smelting-works. Several of the old furnaces at this establishment have been torn down, and will not be rebuilt until next spring.

GRIFFIN.—This property is in the new mining district on the west side of Tennessee Park, about six miles from Leadville. A shaft has been sunk about sixty feet. It is entirely in mineral, and is daily yielding a considerable amount of ore, which is shipped to the Arkansas Valley smelter. The ore consists of quartz, galena, zinc-blende, and possibly some antimony. The silver occurs as sulphurets, and pieces of ore are frequently met very rich in the latter mineral.

IRON SILVER.—A small force of men is again at work on the plant at the Moyer shaft, preparing for the resumption of work on the shaft.

LA PLATA.—All five of the furnaces are in blast.

LITTLE CHIEF.—This mine, although closed down during the first ten days of November, made shipments during the month of 150 tons of ore. Owing to repairs to machinery and the performance of considerable unproductive exploration-work, the operations of the month have resulted in yielding barely enough to pay the unusual expenses, and no profit was derived for November's work.

MORNING STAR.—A four-foot body of ore is exposed in the Kitchen shaft of this mine, which it is calculated will run from $200 to $300 a ton.

ROBERT E. LEE.—This company has recently taken over ten thousand dollars from supposed barren ground in the vicinity of the south shaft.

ST. LOUIS.—The output of this mine, formerly the Miner Boy and Colorado Prince mines, during November amounted to 500 tons of ore. The average value of the ore is about one and a half ounces in gold to the ton, and fifteen ounces in silver. The ore is extracted from a strong vein opened on the line of the Colorado Prince tunnel, about 500 feet from its entrance. During the past week, a seam of ore eighteen inches in width has been discovered that will run ten ounces in gold to the ton and seventy-five ounces in silver. During the past few days, boilers, steam-pumps, and hoisting machinery have been purchased by the lessees, and preparations are making to develop the vein below the tunnel level.

PITKIN COUNTY.

The smelter at Aspen has shut down, and will not start up again until there is a certainty of buying ore in quantities to warrant the expense of running.

SUMMIT COUNTY.

ROBINSON.—Mr. Greer, the lessee, reports shipping ore at the rate of about one hundred cars a month. The ore-body in the lower levels is stated to show a marked improvement.

DAKOTA.

FATHER DE SMET.—The superintendent's report for nine days ended November 30th shows: Ore extracted from first level, 1500 tons; second level, 800 tons; third level, 400 tons. Ore milled, 2700 tons. Golden Gate south header, third level, advanced 13 feet.

STAND BY.—The twenty-stamp mill, recently started up, works smoothly, and the mine is showing up well.

IDAHO.

BALTIMORE & VICTORIA.—The Baltimore, Victoria, Minnie May, Cumberland, and Ida Harland lodes and the Baltimore mill site—all situated in Warm Springs Creek Mining District, Alturas County—are to be worked by this company, recently organized at Salt Lake City with a capital stock of $1,500,000.

KENTUCK.—For the purpose of carrying on a "great mining business," this company has been organized with a capital stock of one million dollars. The property proposed to be operated is situated in Mineral Hill Mining District in the county of Lemhi, and consists of the Kentuck and the Lost Miner lodes.

MICHIGAN.

The product of the mines mentioned for the month of November is reported in tons as follows:

Calumet & Hecla	1757	Copper Falls	59
Quincy	452	Pewabic	45
Franklin	201	Portage	40
Atlantic	168	Wolverine	40
Allouez	100	Hancock	34
Huron	73		

CONGLOMERATE.—One head of Ball's stamps in the new mill of this mine, at Lac la Belle, started up some three weeks ago and is working very satisfactorily.

HURON.—The directors have levied an assessment of one dollar per share. The Houghton *Mining Gazette* says: The decided improvement in the lode in various parts of the mine, which the last two monthly products, 70 and 73 tons respectively, corroborate, fully warrants the management in erecting another head of Ball's stamps, which will admit of the mine doubling its present handsome product and assuming a position to earn something for its stockholders. To make this much needed addition to the mineral crushing plant, this last assessment is called, which will be ample, we are informed, to pay for the new machinery and the other expenses on the mine incident to its dressing-works' enlargement.

IRON STAR.—This new corporation has been recently organized by Detroit and Lansing parties, principal among which are James M. Turner and John S. Newberry. Capital stock, $500,000, with $5000 actually paid in. It is not stated exactly where the new company proposes to operate, but presumably the Agogebic District will be its field.

ROPES.—The official report shows that a clean-up of all the rock treated—272 tons—had just been finished. The following facts are given:

Gold from mill	$1,323.02	
Gold from concentrates	328.14	$1,651.16
Silver (native) from mill	166.01	
Silver from concentrates	192.80	358.81
Total gold and silver		$2,009.97

The records kept at the mill show that the ore fluctuated considerably in value. The first lot milled was from a shaft sunk to a depth of 25 feet, the upper portion giving a mill result of $6 or $7 per ton, the lower portion, from $14 to $15. The third test of ore treated was 150 tons from drifts run at a depth of 25 feet and a continuation of the shaft downward, which yielded about $6 per ton. At a depth of 30 feet, a dike of greenstone was encountered, both in the drift and the shaft, breaking up the lode and forming fully 50 per cent of it. The 150 tons was composed of this mixed matrix. It was subsequently found that the drift and shaft were entirely off the lode, a cross-cut to the south of a few feet from the bottom of the shaft, which was down 45 feet, revealing it in its full width and richness, and a like cross-cut in the same direction from the end of the drift, 20 feet from the shaft, also found in all its former richness and strength. This fact shows plainly why the yield of gold and silver was not greater. The fourth lot milled was 22 tons of siliceous talcose slate from an opening 100 feet east of the Curry shaft, where a belt of this slate 8 feet thick lies between two quartz lodes each 4 feet thick on the north and south of it. A shaft was sunk 14 feet and the belt cut across, as well as the two quartz-veins. From this run, per ton of rock, $3 at the mill and $2.50 from the concentrates were obtained. It was the purpose of the management to have milled a quantity of ore from the north lode, as it runs much higher in gold than the other openings, with but little silver, but the arrival of cold weather prevented. Examination of the tailings taken from the plates and concentrator give from $6 to $9 in gold and from $2 to $3 in silver, per ton. Two assays of 50 pounds of the tailings, after the run, showed, respectively, gold, $18; silver, $2.24; and gold, $15; and silver, $19 per ton. This great discrepancy shows that amalgam has gone over from the mill and is the cause of it. The results as shown give a value of over $20 per ton on the ore as it was run, and it is expected on the resumption of mill work that certain appliances will be brought into requisition which will reclaim that portion which has heretofore been lost. Fraser & Chalmers, the mill builders, have the matter now in hand, and are confident they can quickly remedy the difficulty.

During the last ten days of work, the developments made did more in proving the width and richness of the lode than all that had been performed previous to that time. The trial, even with its numerous drawbacks, can not be looked upon as other than a most favorable one, and the management, together with those familiar with the mine's showing, are confident that the success of the enterprise is already well assured, and that a renewal of operations will be met with results fully up to the standard as set by the most sanguine friends of the enterprise.

TAMARACK.—The sinking of the big combination shaft continues. At present, a depth of 1100 feet has been attained.

MONTANA.

BEAVER HEAD COUNTY.

HECLA CONSOLIDATED.—Another furnace is to be added to the smelting-plant of this company at Glendale, increasing the capacity of the works to 150 tons a day. The Hecla Company, it is reported, is turning out more and better ore from its mines on Lion Mountain than it has done before since its organization.

SILVER BOW COUNTY.

GAMBLER.—It is stated by the Butte *Inter-Mountain* that this claim was lately bought for $1500, and sold to the Montana Copper Company for $8500.

NEPTUNE.—This mine, owned by Mr. Clark, is opening and is producing six tons of ore daily, which is worked in the Moulton mill, and pulps an average of $76.

POLLOCK.—This mine, located east of the Poser and also owned by Mr. Clark, is producing eight tons of ore daily. The last shipment of ore made to the Moulton mill returned $101 per ton.

NEVADA.

EUREKA COUNTY.

EUREKA TUNNEL.—The ore on the Eureka Tunnel dump at the time of attach ment has been sampled and settled for at the Eureka Consolidated furnace with the following results: The sacked ore assayed $574 per ton, silver; No. 1 hard ore, $97, the screenings from which went $46, and the carbonate ore, $59; this last carrying $20 in gold. We are informed that after payment of the Hansen claim and costs, amounting to $476, the yield of this ore, thirteen and a half tons, will be paid on the company's indebtedness. Including this lot, which was taken out of the mine in September, the yield for that month was $6594.23 net to the company.

LINCOLN COUNTY.

DAY.—Work in the mines of this company is steadily pushed ahead. Ore is extracted and shipped to the furnace daily. The mines are at present working a larger force of men than they have for months. The furnace is getting into the best of order at Bristol. The indications are, that it will make a steady run of several months when it starts, which will be about the first of the year.

STOREY COUNTY—COMSTOCK LODE.

At the middle mines, prospecting is pretty much at a stand. In the Chollar and Potosi, no attempt has been made to prospect in a long time. At the Savage they tried it for a long time on the 2700 level, but found themselves headed off in every direction by water, so were obliged to return to the main incline and put in the time at sinking that, until the new hydraulic pump shall make it safe for them to cross-cut in the wet ground above.

At Gold Hill, the Yellow Jacket, Crown Point, and Belcher companies are taking out all the ore that mills on the Carson River can reduce with the present stage of water.

The Alta folks have drained their mine nearly to the 2150 level.

John W. Mackey, who has just returned from a thorough examination of the Comstock mines, while declining a newspaper interview, according to San Francisco papers, apparently wishes it to be understood that his faith in the productiveness of the mines is undiminished. He says that, just as soon as the water can be got out of the lower levels, the public will be astonished at the richness of the remaining deposits. He has ventured no opinion when the water will be exhausted.

MEXICAN.—At the recent stockholders' meeting, held in San Francisco, the following report of work done in the mine for the fiscal year ended November 30th, 1883, was submitted: There have been extracted during the year 94 tons of ore; there have been milled 308 1340-2000 tons, yielding $3929.23, or at the rate of $12.72 per ton, this being the yield of the ore-streak found on the 2700 level near our north line. There have also been extracted from the mine in the work of exploration 4019 tons of waste rock. No work has been done during the past year on the 1600, 2000, 2300, 2500 and 2700 levels, except the necessary repairs to the various drifts and winzes used for drainage and ventilation. At the 2000 and 3100 levels, work was continued. The Sierra Nevada, Mexican, and Union shaft has not been sunk to any great depth during the past year, the work being confined to necessary repairs. In January last, the 14-inch pumps that had been used in the shaft were taken out and 17-inch pumps substituted therefor, thereby increasing the pumping capacity about 50 per cent and enabling the shaft to handle all the water from the Sierra Nevada, Mexican, and Union Consolidated mines without any trouble. By the use of the diamond drill, I have avoided or controlled the influx of large bodies of water, the amount of water in the aggregate being less at this date than twelve months ago. As some increase of water is always found in opening up new levels in depth, this fact proves a material decrease of water in the levels above the 2700, and indicates a further decrease during the next year. Although the ore discovered on the 2700 level, near our north line, proved of no great extent or value, the development of the low-grade ore in the 3100 west cross-cut, as before described, which is probably the same vein in which the joint Ophir-Mexican winze from the 2900 to the 3100 was sunk, gives renewed hope that further explorations may find something of value.

The financial statement shows:

Balance from last year	$69.92
From other mines	514.50
From San Francisco office, sundry drafts on president	289,869.36
Total	$290,453.78

DISBURSEMENTS.

Salaries and wages	$89,981.68
Supplies and miscellaneous expenses	109,349.34
Sierra Nevada, Mexican & Union Shaft Company	86,558.13
Legal expense	416 66
Exchange	1,437.00
Milling	2,469.36
Royalty on ore	154.37
Gross expense	$290,366.01
Balance cash on hand	87.27
	$290.453.78

NEW MEXICO.

SAN PEDRO.—A dispatch from Boston says that the bondholders of this company have voted to foreclose its mortgage and reorganize by issuing new stock to its holders. Fifty per cent of its mortgage is to be canceled, and for the remainder preferred stock at $10 per share is to be given. Each bond is to contribute $25 in cash. The claim of G. W. Ballou & Co. against the company, amounting to $240,000, is to be reduced to $200,000, and payment made in preferred stock.

PENNSYLVANIA.

Mr. John Eyerman, of Easton, Pa., sends us the following:

THE FRIEDENSVILLE ZINC MINES.—After a number of years of idleness, work has again begun at the old Ueberroth mine, formerly owned by the Lehigh Zinc Company, but now owned by Messrs. Osgood & Co., of New York City. Four boilers (out of sixteen, which were used to run the large West engine) are in operation. They supply steam for two donkey-pumps that are used in attempting to empty the mine of a great body of water. They have been working three weeks, and about ten feet of water have been pumped out in this time. No doubt the large engine will be used, as it will take months to pump the mine dry with the two donkeys. The surface opening of the mine is 465 feet in length by 435 feet in width. It is said that the mine is 250 feet deep. The water is now about 49 feet from the surface, making about 200 feet of the mine still under water. The bottom was reached by an inclined plane, besides several shafts. The engine-shaft at the West engine is 35 feet by 24 feet. The diameter of each of the two pipes is 36 inches. Each walking-beam of the engine weighs 48,000 pounds, and it is stated that it required 40 head of horses to convey it from Bethlehem, three miles distant. The cylinder is 110 inches in diameter, and has a ten-foot stroke. The engine can raise 12,000 gallons of water 300 feet in one minute. Besides this large engine, there is a smaller one, just opposite, on the other side of the mine opening. The shaft is 18 by 15 feet. When these two engines were working, all the wells, for miles around the country, were dry, and the Saucon Creek a large river.

As the ore (calamine, smithsonite, and sphalerite) in this mine is near the surface, it is not, at present, difficult to work. The calamine is found in large quantities disseminated through the limestone. It is found mostly on the north side of the mine, where it is worked by a small force of men.

This mine has furnished, and will continue to furnish, the finest specimens of calamine (or silicate of zinc) known to the world. It is very often found in botryoidal and stalactical forms. It is not seldom that sheets or plates of calamine from two to three feet square and from one eighth to one fourth of an inch thick, and containing thousands of little crystals on the surface, are found between the crevices of the limestone. Again, it is found as a thin coating to the inside of a quartz geode. This ore is quite scarce at the Endy mine. It seems to have been replaced by the blende. The smithsonite or carbonate of zinc is found in white scales and in granular masses, coating calamine and blende. It is also more commonly found as a brownish earth, which hardens when dry. It is found near the center and along the west side of the mine. It has often been mistaken for clay. This is also mined at present by a small number of men. The sphalerite or zinc-blende is not mined. It is found throughout the mine, with pyrite disseminated through it. It is not met with in as large quantities here as at the Endy mine. Greenockite (sulphide of cadmium), hydrozincite, and goslarite (sulphate of zinc) are met with in smaller quantities. The sulphate of zinc is scarcely ever found. A considerable quantity of greenockite has been mined. It is found as a yellowish powder coating blende and limestone. It was formerly separated at the Bethlehem works.

The ore is conveyed in wagons from the mines to a wharf on the Saucon Iron Company's siding, about two miles from Bingen, on the Philadelphia & Reading Railroad. From this point it is forwarded to Bergen Point, N. J.

Zinc is reported to have been discovered in Lehigh County, at Coplay, and on a farm near Shinersville.

The Ueberroth mine was opened about 1850. The first person to announce the mineral was the well-known mineralogist, the late Prof. William Th. Roepper, of Bethlehem. He had strolled, one Sunday, through the farm of Jacob Ueberroth, and, finding several specimens of a crystallized substance, took them home, and afterward pronounced them to be calamine. His discovery led to the opening of the great zinc mines. Until the company failed, the ore was conveyed to the Bethlehem works. This company now obtains its ore (zincite and willemite) from Franklin Furnace, Sussex County, N. J. Works for the production of zinc oxide were built at Bethlehem about 1853. The Lehigh Zinc Company now owns a mine (producing zinc and lead) near Landisville, on the Pennsylvania Railroad, in Lancaster County, Pa. It is known as the Bamford zinc mine.

UTAH.

The bullion shipments made to Salt Lake City during the eleven months of this year amounted to $6,326,780. This assures a yield considerably in excess of that of any previous year, inasmuch as several steady producers are not reported in these weekly statements. The values, too, are fixed at local rates.

JUAB COUNTY.

WAR EAGLE.—A contract has been let to run a 186-foot tunnel on this mine. There is a tunnel of 130 feet in length already on the claim, and, with the 186 feet additional, the owners hope to tap the vein.

SALT LAKE COUNTY.

GERMANIA.—The Germania Lead-Works are now building a large structure, which will be completed in about a month, says the Salt Lake *Tribune*, for the purpose of increasing the manufacturing facilities. The company purposes manufacturing all of the products from the smelters into every conceivable article that can be made from lead. The company will begin refining bullion immediately, no work of that kind having been done at the works for at least a year past. Hereafter, but little if any bullion will be shipped East, as the company in doing its own refining and utilizing its lead can dispense with these shipments. The gold and silver will be sent to New York. The works now produce about fifteen or twenty tons of bullion daily, aggregating about $2000 in silver and gold and about $1000 in refined lead. Out of this lead, there will be manufactured, when the works are completed, lead pipes, white lead, red lead, granulated lead, test lead, litharge, solder, Babbitt metal, and also all colors that are used in paints. The company has recently erected a fine sampling-mill, where all of the sampling of ores bought from the different mines is done. There are no such works nearer than Omaha and San Francisco. The Germania works will be so perfect that the company will be able to take the ore from the mines, sample it, smelt it, refine it, and manufacture the lead into almost any article for which that metal is used. The company is shipping constantly large consignments of white lead, in the shape of pipe, and is supplying a greater part of the territory. About 100 men are employed, and when the additions are completed and the machinery erected, there will be work enough for 150 men. Three assessments have recently been levied, aggregating $40 per share. This will make the capital stock $500,000, full-paid. With the present increase in the business, there is no doubt but that the capital stock will be increased to $1,000,000.

SUMMIT COUNTY.

BALTIMORE.—The company is running a drift at its mine on Connor Hill. It is driving through solid rock. The tunnel is now 450 feet long, with very good indications.

TOOELE COUNTY.

COLUMBIA.—This company has recently been organized with a capital stock of $500,000 for the purpose of carrying on mining and tunneling, and business operations on the General Hancock, the Grampian, the Hughes, the King Philip, and the Powell lodes, in the Columbia Mining District.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Dec. 14.

The mining market this week presents but few items of interest. While the aggregate number of dealings exceeds that of last week, they were not characteristic of any new or important features. Northern Belle continues to decline, and to-day was quoted at its lowest price on this market. Iron Silver was in great demand, and regained its former strength, being held firmly throughout. Sonora was very actively dealt in and was a little weak. Amie was actively sold and was also weak. Eastern Oregon suffered a strong decline, and was not so largely dealt in as usual. A complete summary of the market is given below. The total number of shares sold aggregates 120,260, as against 110,538 last week.

The Comstock shares were quiet and were generally weak. California sold from 28@21c., with a small business. Consolidated Virginia was fairly dealt in at irregular prices; it sold from 40@31@34c. Sierra Nevada was weak, under a small business, selling from $3.70@$3.05@$3.40. Union Consolidated was also weak, selling from $3.45@$3@$3.05. Mexican sold from $2.60@$2.10. Ophir was strong under a small business, selling at $7. Hale & Norcross sold at $1.75. Sutro Tunnel was quiet and steady, selling from 15@16c.

The Leadville stocks were actively dealt in at about steady prices. Amie was irregular, with a very active business, selling from 12@9@10c. Chrysolite was quiet and a little weak; it sold from $1.35@$1.25@$1.30. Dunkin was steady, with a small business, selling from 26@28@27c. Breece sold at 16c. Iron Silver was strong, under a very active business; it sold from $1.85@$2 10, the transactions aggregating 14,350 shares. Leadville was strong, with a fair business, selling from 40@50@49c. Little Chief was quiet and steady, selling at 56c. Climax sold at 7c.

The Bodie stocks were quiet and steady. Bodie Consolidated sold at 70c. Standard was quiet and irregular, selling from $6@$5.75@$5.88. Bulwer was moderately dealt in at steady prices, selling from 40@45c. Goodshaw sold at 16c.

The Tuscarora stocks were very quiet and were steady. Grand Prize sold at 28c. to-day. Argenta was quiet at 10c. Belle Isle sold at 20c. Navajo was quiet and steady from $3.20@$3.25. Independente sold at 10c., under a small business. Elko Consolidated was quiet and steady, selling at 19@18c.

In the miscellaneous list, Alice was strong, under a small business, selling from $2.50@$2.80@$2.70. Green Mountain was moderately dealt in at irregular prices; it sold from $1.20@$1.10@$1.15. Horn-Silver was a little weak under moderate transactions, selling from $6.50@$6. Northern Belle continues to decline; it sold from 45@20@22c. under moderate dealings. Robinson Consolidated was quiet and irregular, selling from 30@34@32c. Sierra Grande was steady at 66@64@65c., with a small business. Silver King was strong, selling at $7.25.

Barcelona was quiet and a little weak, selling from 23@20c. Central Arizona sold from 24@20c., under a small business. Decatur was moderately dealt in at steady prices, selling at 4c. Durango sold at 3c. Eastern Oregon was quite weak under a small business; it sold from 44@14@16c. Harlem was moderately dealt in at irregular prices; it sold from $1.20@$1.10@$1.15. Sonora Consolidated was very active at irregular prices; it sold from 26@22@23c. North Mexican was quiet and strong, selling from 51@65c. Colorado Central sold from 40@35@39c., under a small business.

MEETINGS.

The Alice Gold and Silver Mining Company, Walker Brothers' Bank, Salt Lake City, Utah. Annual meeting of stockholders and election of trustees, January 14th, between ten o'clock A.M. and five o'clock P.M.

The Colorado Central Consolidated Mining Company, No. 25 William street, New York City. At the recent meeting of the Board of Trustees, the following trustees were elected officers of the company for the ensuing year: President, Paul Lichtenstein; Vice-President, Herm. R. Baltzer; Secretary, Paul O. d'Esterhazy; Treasurer, R. V. Martinsen; Superintendent, at Georgetown, Colorado, George W. Hall.

The Gold Cliff Gold Mining Company, No. 46 Cliff street, New York City. Annual meeting of stockholders and election of trustees, December 22d, at one o'clock P.M.

The Grand Central Mining Company, Youngstown, Ohio. Annual meeting of stockholders and election of trustees, January 15th, at eleven o'clock A.M.

The Lake Huron Silver and Copper Mining Company, North British and Mercantile Insurance Buildings, St. François Xavier street, Montreal, Canada. Annual meeting of stockholders and election of trustees, third Wednesday in January next, at one o'clock P.M.

The San Juan & New York Mining and Smelting Company, No. 70 Broadway, office of Spencer, Trask & Co., New York City. Annual meeting of stockholders and election of trustees, January 22d, at three o'clock P.M.

DIVIDENDS.

The Homestake Gold Mining Company, of Dakota, has declared its sixty-fourth dividend of $25,000, payable at the office of the transfer-agents, Lounsbery & Haggin, Mills Building, No. 19 Broad street, on the 26th. Transfers close on the 20th. Total dividends to date, $2,287,500.

The Mount Pleasant Mining Company, of California, has declared a dividend (No. 4) of twenty cents per share, or $30,000, payable December 15th.

PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report as follows:

The week has been a dull one. Friday morning last, the market touched $1.13, but was rapidly advanced to $1.17⅝, Saturday afternoon. Monday, it opened at $1.16½; and during the present week, it has gravitated between $1.13⅝ and $1.16. Meantime, the price of refined oil has advanced from 9@9¼c., and is now 9¼c. bid. From the best information we get from refined oil men, the export trade for the past three months has been the dullest for any similar period for years. The visible supply in seven European ports is about the same, perhaps a little more, than this time last year; but there has been no year since 1875 when there has been so little refined oil contracted for, for future delivery, as now. Last year, there were about one million barrels more of contracts held by the foreign trade than at present. Low prices have prevailed in Europe this fall; but when their present supply is exhausted, they will become buyers, and as the refined interests, Standard, Tidewater, and others, are now united in action and interest, they can fix the price of refined at a figure that will be remunerative, and higher prices for refined may be expected.

There has been a great deal of discussion during the week in both the New York Mining Stock and National Petroleum Exchange and the New York Petroleum Exchange on the proposed consolidation of the two. In each, there is opposition on the part of a minority; but the prevailing sentiment seems to favor a union of forces, and the establishment of one strong institution. It is believed that the question of consolidation on each Exchange will be voted upon, on the 22d inst.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
Dec. 8	$1.16¼	$1.17¼	$1.16⅛	$1.16⅛	5,223,000
10	1.16⅝	1.16⅝	1.15⅝	1.15⅝	7,379,000
11	1.16	1.16	1.14	1.14⅛	7,158.000
12	1.14¼	1.15	1.13⅝	1.14⅛	7,238,000
13	1.15⅛	1.15¼	1.13⅞	1.14	5,199,000
14	1.13⅞	1.14⅝	1.13½	1.14⅛	4,698,000
Total sales.					36,895,000

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, December 13.

There is no improvement in the market the past week, and prices drag along with only slight variations, except for Quincy Mining Company, which shows a decline from $52@$49¾. Calumet & Hecla was quite firm during the week at $239½, until to-day, when it touched $239. Franklin, after selling at $12 last week, declined on small lots to $11¾, a round hundred being taken at $11⅞. There were no dealings in the other stocks on the list, there being not the slightest disposition to buy or sell for speculative account. The condition of the ingot copper market does not warrant any expectation of a rise in that direction, and consequently we may look for a dull market for some time to come.

There was a little more activity in the silver stocks but not enough to indicate a boom in this class, for the present, at least. Bonanza sold at $1 7/16, a decline of $⅛. Harshaw, 50c. Crescent, 15c. San Pedro awoke from a long sleep, and sold at 12½@15c. Sullivan sold at 89@90c. at the regular Board, and as high as 94c. at the Mining Exchange. Silver Islet declined from $3, sales, last week, to $2½, and rallied again to $3.

At the Mining Exchange, some considerable activity has developed in Empire, and all the lots for sale at 25c. have been readily taken. This stock has always been rather a Boston favorite, and we should not be surprised to see it resume its old-time activity. Bowman was quite steady at about 14c. until to-day, when it declined again to 12c. Dunkin is in fair demand at 27@29c.

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. Dec. 7.	Dec. 8.	Dec. 10.	Dec. 11.	Dec. 12.	Dec. 13.
Albion						
Alpha	1				1	1
Alta	1⅛	1	1⅛	1⅜	1¼	1⅜
Argenta	.05				.05	.05
Bechtel						
Belcher	1		1	1		.90
Belle Isle				.30	.20	
Best & Belcher	2⅞	2¾	3	2¾	2¾	2¾
Bodie	.75	80	.80	.80	.75	.75
Bullion						
Bulwer						
California	.20	.25	.25		.15	
Challar	2	2	2¼	2⅛	2⅛	2¼
Con. Virginia	.35	.30	.40	.30	.30	.35
Crown Point	1		1	.95		
Elko Cons	.20	.20	.20	.10		.05
Eureka Cons		2¾		3½	3¼	3¼
Exchequer						
Gould & Curry	1⅛	1½	1¾	1½	1⅝	2¼
Grand Prize	.25		.30	.25	.25	.25
Hale & Norcross	1¼	1⅛	1¼	1⅛	1⅛	1⅛
Independence			.10		.10	
Martin White						
Mexican	2¼	2¼	2⅜	2⅛	2⅛	2⅛
Mono						
Mount Diablo		2¾		2¾	3⅜	
Navajo	3⅜	3¼	3¼	3½	3½	3⅜
Northern Belle	.10	.25	.15	.15	.15	.20
North Belle Isle						
Ophir	9	8½	7¾	7	7¾	10
Overman						
Potosi	.85	.80	1	.80	.80	.90
Savage	95	.80	1	.90	.90	
Scorpion						
Sierra Nevada	3⅛	3¼	3¼	3	3	3¼
Silver King						
Tip Top						
Union Cons	2⅞	2⅞	3⅛	3	2⅞	3
Utah	1¾	1¾	1¾	1½	1½	1½
Wales Cons						
Yellow Jacket	1⅞	2⅛	2⅜	2	2	2

BULLION MARKET.

NEW YORK, Friday Evening, Dec. 14.

The silver market abroad has been weaker, under a diminished demand for India exchange; and here, it has been affected in addition by a lower rate for sterling exchange.

DATE.	London. Pence.	N. Y. Cents.	DATE.	London. Pence.	N. Y. Cents.
Dec. 8	50 13-16	110⅜	Dec. 12	50 13-16	110⅜
10	50 13-16	110⅜	13	50¾	110¼
11	50 13-16	110⅜	14	50 13-16	110⅛

Bullion Receipts at New York.—The bullion received from the mines at the various offices in this city during the week ended December 14th, as compiled from various sources, amounted to $207,878, as against $288,000 reported for the previous week. The receipts from January 1st, 1883, to date are $11,026,321.

Foreign Bank Statement.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate for discount, and it remains at 3 per cent. During the week, the bank gained £193,000 bullion, and the proportion of its reserve to its liabilities was raised from 42¼ to 43⅜ per cent, against 41⅝ per cent at this date last year. The weekly statement of the Bank of France shows a decrease of 2,308,000 francs gold and a loss of 4,480,000 francs silver.

Ten-Cent Coin for Hawaii.—The superintendent of the Mint at Philadelphia has been notified that the Hawaiian government desires to substitute a ten-cent silver coin for the twelve and a half cent piece origi-

nally ordered, and has been granted authority to prepare a die in accordance.

BULLION PRODUCTION FOR 1883.

We give below a statement showing the latest bullion shipments. These are officially obtained from the companies, where that is possible; and where official statements can not be procured, we take the latest shipments published in those papers nearest to the mines reported. The table gives the amount shipped for the week up to the date given, as well as the aggregate shipments to such date from the first of January, 1883.

The shipments of silver bullion are valued at $1.29·29 per ounce troy; gold at the standard $20.67 per ounce troy. The actual value of the silver in the following table is therefore subject to a discount, depending on the market price of silver. If the price of silver be counted at $1.11 an ounce, which has for some months been about its average value, the following figures, where they relate to silver bullion, should be diminished by about 14⅛ per cent, to arrive at actual value.

MINES.	States.	Month of November.	Year from Jan. 1st, 1883.
*Alice, G. S.	Mont		$885,934
*Alta-Montana, G. L. S.	"		§10,625
*Belmont	"	——	12,604
Bodie, G. S.	Cal		199,859
Bodie Tunnel, G.	"		52,742
*Bonanza King, G.	"		426,967
*Boston & Montana, G.	Mont		140,323
*Central Arizona, S.	Ariz		35,845
*Christy, S.	Utah		219,459
*Chrysolite, S. L.	Colo	17,624	345,403
*Consolidated Bobtail, G.	Colo		62,743
*Contention, S.	Ariz		791,389
*Crescent, G. S. L.	Utah		266,498
*Custer, G. S.	Idaho		43,572
*Deadwood-Terra, G.	Dak		388,562
*Derbec Blue Gravel, G. S.	Cal		115,043
Dunkin, S. L.	Colo		49,250
Evening Star, S. L.	Colo		47,061
*Father de Smet, G.	Dak	11,813	312,494
*Frisco M. and S. Co., G. S. L.	Utah		§77,084
*Granite Mountain, S.	Mont		323,523
Gunnell, S.	Colo		58,828
*Haile, G.	S. C.		34,625
*Head Center Consolidated	Ariz		45,340
*Head Center and Tranquillity	Ariz.		89,108
*Hecla Consolidated, G. S. L.	Mont	**	633,979
*Homestake, G.	Dak.		866,709
*Hope, S.	Mont		82,060
Horn-Silver, S. L.	Utah		2,737,200
*Howell S. and Mg. Co., G. S. L.	Ariz	49,075	193,952
Idaho, G.	Cal		150,642
*Independence, G. S.	Nev		32,991
*Iron Silver, S. L.	Colo		1,031,952
*Jocuistita, S.	Mex		‡258,959
*Kentuck, G. S.	Nev		20,550
*Lexington, S.	Mont	119,134	1,173,685
*Little Pittsburg, S. L.	Colo	15,441	87,552
*Marguerite, G.	Cal		74,622
*Martin White, G. S.	Nev		136,317
Morning Star, S. D.	Colo		84,428
Mount Diablo	Nev		428,250
*Navajo, G. S.	"		411,642
*North Belle Isle	"		2,153
Northern Belle, S.	"		539,105
*Ontario, S. L.	Utah		1,807,178
*Oxford, G.	N. S.		54,055
*Phœnix, G.	N. C.		21,009
*Pinal Consolidated, S. L.	Ariz		181,485
*Plymouth Consolidated, G.	Cal	77,366	450,456
*Satemo, G.	N. S.		2,500
*Silver Bow, G. S.	Mont		203,947
*Silver Cord, G. S. L.	Colo		941,305
Silver King, S.	Ariz		367,802
*South Yuba, G.	Cal		37,272
Standard, G.	Cal		963,619
Star, S.	Nev		27,095
*Stormont, S.	Utah		215,552
Syndicate, G.	Cal		56,008
Tintic M. and M. Co.	Utah		34,670
*Tip Top, S.	Ariz		37,868
*Tombstone, G. S. L.	"		604,618
Wyoming Consolidated.	Cal		31,541
Yellow Jacket, S.	Nev		265,885
Total amount of shipments to date			$20,343,485

* Official. † Net value. ‡ Assay value. § Not including value of lead. *G. Gold. S. Silver. L. Lead.* The dash (——) indicates that no shipments have been made in the month named. ** Silver valued at $1.10 per ounce.

METALS.

NEW YORK, Friday Evening, Dec. 14.

Copper.—Business is very quiet, transactions being on a limited scale, with Lake at 14⅛@15c., Common outside brands, 14@14¼c., and the best of this class 14⅛@14¾c. Consumption appears to be fairly good, but we are approaching the end of the year, a time when manufacturers do not care to increase supplies of raw material. London is again lower, Chili Bars being cabled £57 10s., and Best Selected, £65. In spite of this decline, there are some inquiries at hand from abroad.

Tin.—There has been a bad break in this metal in London and here, due, it is said, largely to the increase in the production in the Straits settlements. According to dispatches to the Metal Exchange, London dropped from £84 on Wednesday to £83 on Thursday, and fell to-day to £82 10s. Here, spot Straits is 18⅝@18½c., with futures as low as 18¼c.

Lead.—Except a retail business in car-load lots, absolutely nothing has been done. Nominally, quotations are 3·60c., that figure being the one that it might be possible to get lead for, though for the time being there is little of it in the market. There is, however, no confidence in the metal, and there are few who would venture to advance any arguments in favor of an improvement.

Messrs. John Wahl & Co., of St. Louis, wire us as follows:

Our market is a little easier. Sales during the week aggregate 250 tons of Refined at 3·30c. Common lead is nominally the same as Soft lead.

Messrs. Everett & Post wire us as follows from Chicago:

Common and Refined lead are salable at 3·35c. Offerings are only moderate.

Spelter.—The dullness still continues at unchanged quotations, which are 4⅝@4½c. for Common Domestic.

Antimony.—Unchanged at 10½c. for Hallett's and 11½c. for Cookson's.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Dec. 14.

Mr. Edward J. Shriver, Secretary of the Metal Exchange, has published the following returns from 137 furnaces, of which 61 are in blast and 76 out of blast:

All grades.	Unsold stocks. Nov. 1.	Dec. 1.
Anthracite	24,599	16,063
Bituminous	38,078	39,976
Charcoal	38,520	39,787
Grand total	101,197	95,826

	Production. In Oct.	In Nov.
Anthracite	12,786	13,442
Bituminous	36,829	37,883
Charcoal	6,319	6,102
Grand total	55,934	57,427

American Pig.—The market is quiet, transactions being limited to small lots to cover urgent necessities. There are frequent reports of sales at low figures; but they are so generally accompanied by exceptional circumstances that they can not be looked upon as representing average quotations. We hear of a sale of 5000 tons of Colebrook forge iron reported as having been sold at $17, delivered at works near the furnace. We quote Foundry No. 1, $20@$22.50, ordinary to choice; No. 2, $18.50@$19.50; and Gray Forge, $17@$19, all at tide-water. There have been some transactions in Bessemer pig at private terms. It has been a mystery how steel-makers could afford to pay the nominal figures hitherto current. Spiegel is dull, so far as actual transactions in the higher grade are concerned. We quote, nominally, $29@$29.50, with the market in buyers' favor.

At the Exchange, not a single transaction was reported during the week.

Scotch Pig.—The market is very dull and quiet, transactions being limited to small lots.

We quote ex ship and to arrive: Coltness, $22@$23; Langloan, $22.75@$23; Summerlee, $22.50; Eglinton, $20@$20.50; Glengarnock, $21.50@$22; Dalmellington, $20@$21.

Warrants at the Exchange to-day were 44s. 2d.

Steel Rails.—From four different quarters come reports that indicate a further weakening of the market. In Chicago, rails have been offered shading $35, delivered there by a mill which besides is unfavorably located in reference to that market. Here, there are rumors that contracts lower than $35 at mill have been accepted, and similar indications reach us from Philadelphia.

Old Rails.—We quote nominally $22@$22.50 for Ts.

Philadelphia. December 14.

Pig-Iron.—The only changes which have taken place in crude iron this week related to prices for some kinds of forge and foundry. A few days ago, several large transactions took place in inferior forge iron, and in consequence of this, some makers of brands which are called standard have been holding prices a little more firmly; but it is useless to try to advance prices at present; too many furnaces have heavy stocks on hand, and too many lots are offered on the market at buyers' terms. A few large consumers bought freely, but that demand seems to have been met, and at present there is no disposition to buy largely. Best grades of Foundry have sold this week at $21.50; some 25 to 50-ton lots sold at $20@$20.50. Numerous speculative inquiries are made, but the prices offered are too low to be accepted. Some authorities think that, on account of the smallness of stocks in second hands, an improving activity will take place in January, and they are willing to buy now, provided their offers are accepted. The strong companies are satisfied that nothing can prevent a strong movement, and are content with the present condition of things. Ordinary No. 2 Foundry sells at $19@$19.50. A little inferior is to be had at $18.50. Gray Forge, $18@$19 delivered. Nothing of desirable quality can be bought under $18.50. Two or three thousand tons have been offered on the market, and negotiations are pending, but prices asked are a little too high. In fact, if makers want to sell now for future delivery, they find it very difficult to move stocks above cost.

Foreign Irons.—Very little business has been reported this week. Some inquiries from Western parties are made; but it is doubtful whether more than $19.50 would be paid, and the nominal price is $20.50. A little Spiegeleisen has sold, and there are inquiries for large lots, but the best price to be had is under $29. Scotch Iron is selling very slowly, and buyers decline offers made from New York of lots of from 100 tons up.

Muck Bars.—From 600 to 700 tons of Muck Bars have sold from $32.75@$33.25.

Merchant Bar.—Considering the season, the demand for the past week may be called fair, but prices named are so low as to make it a matter of indifference whether mill-owners continue or not. Two or three mills will shut down this week; three or four country mills will certainly shut down; and it is said that others will follow next week. A very unsatisfactory trade is reported at country mills. The only good sales were of common iron, but prices are as low as 1·70c.

Sheet-Iron.—Local manufacturers of sheet-iron are reducing output, and are declining to make further concessions. Some large lots were refused, offers being too low, and nothing better can be done for buyers at present. The only demand is for thin sheets.

Nails.—Makers here report a rather slack movement, and jobbers backward as to next quarter's requirements. The action of the Western people has put a wet blanket upon this market. Nominal quotations, $2.80@$2.90; but buyers can make better terms. Offers are made at $2.60.

Plate and Tank Iron.—Several small sales were made this week at one tenth below usual quotations. Some manufacturers have inquiries in hand for next quarter's delivery, but can not secure business this month. There are offers for Plate at 2¼c. Shell sells in small lots at 2¾@3c. Flange, 3·80@4c. Fire Box, 5c.

Steel Rails.—There are rumors of inquiries for from 20,000 to 30,000 tons, but at present writing the orders have not been given out. Whether they will be placed before January is doubtful. Makers say that the restriction of output consequent upon the closing down of mills will prevent any further weakening tendency, and buyers who are offering $33 and $34 will be compelled to order at $35.

Wrought Pipes and Tubes.—A number of large orders have been placed within a day or two, and discounts are less.

Old Rails.—There are numerous inquiries from parties in the interior. Ordinary quotations, $23@$23.50 for Tees. Double-Heads, nominal at $25.

Pittsburg. December 12.

Rumors of the shutting down of mills, and the further restriction of the output of iron and steel, prevail throughout this section. Prices are weak and demand irregular. Standard brands of Forge are held at $17.50@$18. Sales of the Marshall iron have been made at about $16, and it is reported that some large lots will be quietly disposed of, and this has had an unsettling effect on prices. Cold-Blast Charcoal has sold at from $29@$32. Native ore coke iron, $18 for Foundry, and $17.50 for Forge. Muck Bar is offered at $32, with but little selling. Manufactured

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.
	Dec. 8.		Dec. 10.		Dec. 11.		Dec. 12.		Dec. 13.		Dec. 14.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon.	2.50	....	2.75	....	....	....	....	....	2.80	....	2 70	....	1,100
Amie Con., Co.	....	....	12	....	.11	.10	.10	.09	.10	....	.10	....	13,500
Argenta, Ne.	....	....	....	....	....	....	....	....	....	....	.10	....	100
Bar. & Walker, Ut.	....	....	....	....	....	....	....	....	....	....	....	....	....
Bassick, Co.	....	....	....	....	....	....	....	....	....	....	6 50	....	100
Belle Isle, Ne.	....	....	....	....	....	....	....	....	.20	....	....	....	300
Bodie Cons., Ca.	....	....	....	....	....	....	....	....	.70	....	....	....	100
Breece, Co.	.16	....	....	....	....	....	....	....	....	....	....	....	800
Bulwer, Ca.	....	....	....	....	.40	....	....	....	.45	....	....	....	400
California, Ne.	.25	....	.28	....	.31	....	....	....	....	....	....	....	1,200
Cal. & Hecla, Mich.	....	....	....	....	....	....	....	....	....	....	....	....	....
Carbonate Hill	....	....	....	....	....	....	....	....	....	....	....	....	....
Caribou Con., Co.	....	....	....	....	....	....	....	....	....	....	....	....	....
Castle Creek	....	....	....	....	....	....	....	....	....	....	....	....	....
Chrysolite, Co.	1.35	....	....	....	1.30	1.25	1 25	....	1.25	....	1.30	....	1,350
Cons. Va., Ne.	.39	.34	.40	.39	.38	.35	.33	.32	.33	.31	.34	.32	9,400
Crown Point	....	....	....	....	....	....	....	....	....	....	....	....	....
Deadwood-Terra, Dk.	....	....	....	....	....	....	....	....	....	....	....	....	....
Dunkin, Co.	.27	....	....	....	....	....	....	....	.26	....	.28	.27	2,950
Eureka Cons., Ne.	....	....	....	....	....	....	....	....	....	....	3.50	....	250
Excelsior, Ca.	....	....	....	....	....	....	....	....	....	....	....	....	....
Father de Smet, Dk.	....	....	....	....	....	....	....	....	....	....	....	....	....
Findley, Ga.	....	....	....	....	....	....	....	....	....	....	....	....	....
Gold Stripe, Ca.	....	....	....	....	....	....	....	....	....	....	06	....	2,000
Gould & Curry, Ne.	....	....	....	....	....	....	....	....	....	....	....	....	....
Grand Prize, Ne.	....	....	....	....	....	....	....	....	....	....	.28	....	100
Great Eastern, Dk.	....	....	....	....	....	....	....	....	....	....	.01	....	1,000
Green Mountain, Ca.	1.15	1.10	1.20	1.10	1.20	1.16	1.15	....	1.15	....	....	....	2,500
Hale & Norcross, Ne.	....	....	....	....	....	....	1.75	....	....	....	....	....	100
Hall-Anderson, N. S	....	....	....	....	....	....	....	....	....	....	....	....	....
Hibernia, Co.	....	....	....	....	....	....	....	....	....	....	....	....	....
Homestake, Dk.	....	....	....	....	....	....	....	....	....	....	12.00	....	100
Horn-Silver, Ut.	6.50	....	....	....	6 25	6.00	6.00	....	....	....	....	....	1,150
Hukill, Co.	....	....	....	....	....	....	....	....	....	....	....	....	....
Independence, Ne.	....	....	....	....	10	....	....	....	....	....	....	....	200
Iron Silver, Co.	2.05	1.85	2.00	....	2.05	2.00	2.10	2.05	2.10	....	2.10	....	14,350
La Plata, Co.	....	....	....	....	....	....	....	....	....	....	....	....	....
Leadville C., Co.	.45	.40	.47	....	....	....	....	....	.50	....	.50	.48	1,275
Little Chief, Co.	.56	....	.56	....	....	....	....	....	.56	....	....	....	500
Little Pittsburg, Co.	....	....	....	....	....	....	....	....	....	....	....	....	....
Martin White, Ne.	....	....	....	....	....	....	....	....	....	....	....	....	....
Moose, Co.	....	....	....	....	....	....	....	....	....	....	....	....	....
Navajo, Ne.	3.25	....	....	....	....	....	3 20	....	....	....	3.25	....	610
Northern Belle, Ne.	.45	....	.35	....	.35	.30	.25	....	....	....	.22	.20	1,910
North Belle Isle, Ne.	....	....	....	....	....	....	....	....	....	....	....	....	....
Ontario, Ut.	....	....	....	....	....	....	....	....	....	....	....	....	....
Ophir, Ne.	7.00	....	7.00	....	....	....	....	....	....	....	....	....	230
Plumas, Ca.	....	....	....	....	....	....	....	....	....	....	....	....	....
Prussian, Colo.	....	....	....	....	....	....	....	....	....	....	....	....	....
Quicksilver Pref., Ca.	....	....	....	....	6.00	....	....	....	....	....	6.00	....	310
" Com., Ca.	....	....	....	....	....	....	....	....	....	....	....	....	....
Rising Sun, Ca.	....	....	....	....	....	....	....	....	....	....	....	....	....
Robinson Cons., Co.	.30	....	.34	.33	.34	.33	.32	.31	.33	.32	....	....	6,900
Saint Joseph's Lead.	....	....	....	....	....	....	....	....	....	....	....	....	....
Savage, Ne.	....	....	....	....	....	....	....	....	....	....	....	....	....
Sierra Grande, N. M.	....	....	....	....	....	....	.65	.64	.66	.64	.65	....	700
Sierra Nevada, Ne.	....	....	3.70	3.15	....	....	3.05	....	3.05	....	3.40	3.05	1,450
Silver King, Ar.	....	....	....	....	....	....	....	....	7.25	....	....	....	100
Spring Valley, Ca.	....	....	....	....	....	....	....	....	....	....	....	....	....
Standard, Ca.	6.00	....	6.00	....	6.00	....	6.00	....	5.75	....	5.88	....	565
Stormont, Ut.	....	....	....	....	....	....	....	....	....	....	....	....	....
Tip Top, Ar.	....	....	....	....	....	....	....	....	....	....	....	....	....
Tombstone, Ar.	....	....	....	....	....	....	....	....	....	....	....	....	....
Vizina, Ar.	....	....	....	....	....	....	....	....	....	....	....	....	....
Yellow Jacket	....	....	....	....	....	....	....	....	....	....	....	....	....

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES
	Dec. 8.		Dec. 10.		Dec. 11.		Dec. 12.		Dec. 13.		Dec. 14		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alta-Montana	....	....	....	....	....	....	....	....	....	....	....	....	....
American Flag	....	....	.03	....	....	....	....	....	....	....	....	....	2,500
Barcelona, G.	.23	....	....	....	.23	....	.23	....	.22	....	.20	....	2,700
Bear Creek	....	....	....	....	....	....	....	....	....	....	....	....	....
Bechtel Con., G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Belvidere	....	....	....	....	....	....	....	....	....	....	....	....	....
Best & B'cher, G. S.	....	....	....	....	....	....	....	....	....	....	....	....	....
Big Pittsburg, S. L.	....	....	....	....	....	....	....	....	....	....	....	....	....
Bradshaw, S.	....	....	.12	....	....	....	....	....	....	....	....	....	100
Buckeye	....	....	....	....	....	....	....	....	....	....	....	....	....
" pref.	....	....	....	....	....	....	....	....	....	....	....	....	....
Bull-Domingo, S. L.	....	....	....	....	....	....	....	....	....	....	....	....	....
Bye and Bye	....	....	....	....	....	....	....	....	....	....	....	....	....
Calaveras, G	....	....	....	....	....	....	....	....	....	....	....	....	....
C'lav'r's W. & M. Co.	....	....	....	....	....	....	....	....	....	....	....	....	....
Cal., G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Central Ariz'na, S.	....	....	.24	....	....	....	....	....	....	....	.20	....	600
Cherokee, G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Chollar	....	....	....	....	....	....	....	....	....	....	....	....	....
Climax, Co.	....	....	....	....	....	....	.07	....	....	....	....	....	200
Colorado Central	....	....	....	....	....	....	.40	....	.35	....	.39	.38	450
Cons. Pacific	....	....	....	....	....	....	....	....	....	....	....	....	....
Crowell, G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Dahlonega, G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Decatur	....	....	.04	....	....	....	....	....	.04	....	....	....	7,500
Dunderberg	....	....	....	....	....	....	....	....	....	....	....	....	....
Durango, G.	....	....	.03	....	....	....	....	....	....	....	....	....	1,000
Eastern Oregon	.44	....	.34	....	....	....	....	....	.20	.14	.16	....	5,700
Elko Cons.	.18	....	.19	.18	....	....	.18	....	....	....	....	....	1,700
Enterprise	....	....	....	....	....	....	....	....	....	....	....	....	....
Fannie Barret	....	....	....	....	....	....	....	....	....	....	....	....	....
Globe Copper	....	....	....	....	....	....	....	....	....	....	....	....	....
Gold Placer, G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Goodshaw, G.	....	....	....	....	....	....	....	....	.16	....	....	....	500
Granville, G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Harlem M. & M. Co.	1.15	....	1.15	....	1.15	....	1.15	....	1.20	1.15	1.15	1.10	4,800
Hortense, S.	....	....	....	....	....	....	....	....	....	....	....	....	....
Imperial	....	....	....	....	....	....	....	....	....	....	....	....	....
Lacrosse, G.	....	....	.08	....	....	....	....	....	....	....	....	....	1,000
Lucerne	....	....	....	....	....	....	....	....	....	....	....	....	....
Mariposa Pref., G.	....	....	....	....	....	....	....	....	....	....	....	....	....
" Com., G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Mexican, G. S.	....	....	2 60	....	....	....	....	....	....	....	2.10	....	250
Miner Boy	....	....	....	....	....	....	....	....	....	....	....	....	....
Mono	....	....	....	....	....	....	....	....	....	....	....	....	....
North Mexican	....	....	....	....	....	....	.51	....	.60	....	.65	....	1,100
North Standard, G.	....	....	....	....	....	....	....	....	....	....	....	....	....
N. Horn-Silv'r, S. L.	....	....	....	....	....	....	....	....	....	....	....	....	....
Ori'nt'l & Miller, S.	....	....	....	....	....	....	....	....	....	....	....	....	....
Parnell	....	....	....	....	....	....	....	....	....	....	....	....	....
Rappahannock, G.	....	....	.08	....	....	....	....	....	....	....	....	....	500
Red Elephant, S.	.06	....	....	....	....	....	....	....	....	....	....	....	300
Ruby, of Arizona	....	....	....	....	....	....	....	....	....	....	....	....	....
Silver Cliff, S.	....	....	....	....	....	....	12	....	....	....	....	....	500
Sonora Con.	.25	....	.25	....	.26	.25	.25	....	.25	.24	.24	.22	15,900
South Bodie, G.	....	....	....	....	....	....	....	....	....	....	....	....	....
South Bulwer, G.	....	....	....	....	....	....	....	....	....	....	....	....	....
South Hite	....	....	....	....	....	....	....	....	....	....	....	....	....
South Pacific	....	....	....	....	....	....	....	....	....	....	....	....	....
State Line, 1 & 4, S.	....	....	....	....	....	....	....	....	....	....	....	....	....
" Nos. 2 & 3, S.	....	....	....	....	....	....	....	....	....	....	....	....	....
Sutro Tunnel	....	....	.16	.15	.15	....	.15	....	.16	.15	.18	....	4,200
Taylor Plumas	....	....	....	....	....	....	....	....	....	....	....	....	....
Unadilla, S	....	....	....	....	....	....	....	....	....	....	....	....	....
Union Cons., G. S.	....	....	3.45	....	....	....	....	....	....	....	3.05	3.00	1,100

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 67,600. Non-dividend shares sold, 52,600.

BOSTON MINING STOCKS.

	Dec. 7.		Dec. 8.		Dec. 10.		Dec. 11.		Dec. 12.		Dec. 13.		Sales
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Allouez	....	....	....	....	....	....	....	....	....	....	....	....	....
Amie	....	....	....	....	....	....	....	....	....	....	....	....	....
Atlantic	....	....	....	....	....	....	....	....	....	....	....	....	....
Aztec	....	....	....	....	....	....	....	....	....	....	....	....	....
Bodie Con.	....	....	....	....	....	....	....	....	....	....	....	....	....
Bonanza D	....	....	1.50	....	....	....	....	....	....	....	1 7-16	....	100
Bowman Sil	.16	.14	....	....	.16	.15	....	....	....	....	.13	.11	6,944
Bruns. Ant.	....	....	....	....	....	....	....	....	....	....	....	....	....
Bulwer	....	....	....	....	....	....	....	....	....	....	....	....	....
California	....	....	....	....	....	....	....	....	....	....	....	....	....
Cal. & Hec.	....	....	239½	....	239½	....	239½	....	239½	239¼	239	....	32
Catalpa	.35	....	.35	....	.35	....	....	....	....	....	.35	....	600
Co. Virginia	....	....	....	....	....	....	....	....	....	....	....	....	....
Contentm't.	.03	....	....	....	.04	.03	....	....	....	....	....	....	2,000
Copper F'lls	....	....	....	....	....	....	....	....	....	....	....	....	....
Crescent	.15	....	....	....	....	....	....	....	....	....	....	....	1,200
"Cusi"	....	....	....	....	....	....	....	....	....	....	....	....	....
Decatur	....	....	....	....	....	....	....	....	....	....	....	....	....
Deer Isle	....	....	....	....	....	....	....	....	....	....	....	....	....
Denver City	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas	....	....	....	....	....	....	....	....	....	....	....	....	....
Duncan	....	....	....	....	....	....	....	....	....	....	....	....	....
Dunkin	.30	.28	....	....	.29	....	....	....	....	....	.29	....	1,200
Elko Con	....	....	....	....	....	....	....	....	....	....	....	....	....
Empire	.26	.24	.27	.23	.25	....	....	....	....	....	.26	.25	11,000
Eureka Con.	....	....	3.63	....	....	....	....	....	....	....	....	....	20
Franklin	12 00	....	11.75	....	12.00	....	11.75	....	11.88	....	....	....	150
Gila County	....	....	....	....	....	....	....	....	....	....	....	....	....
Hancock G.	....	....	....	....	....	....	....	....	....	....	....	....	....
Harshaw	....	....	....	....	....	....	....	....	.50	....	....	....	50
Horn-Silver	....	....	....	....	....	....	....	....	....	....	....	....	....
Huron	....	....	....	....	....	....	....	....	....	....	....	....	....
Independ'ce	....	....	....	....	....	....	....	....	....	....	....	....	....
Indian Qeen	....	....	....	....	....	....	....	....	....	....	....	....	....
Mammoth	....	....	.03	....	....	....	....	....	....	....	....	....	500
Mass. & N.M.	....	....	....	....	....	....	....	....	....	....	.02	....	300
Milton	....	....	....	....	....	....	....	....	....	....	....	....	....
Napa	....	....	....	....	....	....	....	....	....	....	....	....	....
National	....	....	....	....	....	....	....	....	....	....	....	....	....
Ontario	....	....	....	....	....	....	....	....	....	....	....	....	....
Osceola	....	....	....	....	....	....	....	....	....	....	....	....	....
Penn-Breck	....	....	....	....	....	....	....	....	....	....	....	....	....
Pewable	....	....	....	....	....	....	....	....	....	....	....	....	....
Pine Tree	....	....	.08	....	.09	....	....	....	....	....	....	....	2,000
Plymouth	....	....	....	....	....	....	....	....	....	....	....	....	....
Quincy	50.00	....	....	....	....	....	50.00	....	....	....	49.75	49.50	43
Ridge	....	....	....	....	....	....	....	....	....	....	....	....	....
Robinson	.30	....	....	....	.31	....	....	....	....	....	....	....	200
San Pedro	.15	....	.15	12½	....	....	.15	....	....	....	13½	....	800
S'ra Grande	....	....	....	....	....	....	....	....	....	....	....	....	....
Silver Islet	....	....	....	....	....	....	....	....	3.00	2.50	4.00	....	227
Silver King	....	....	....	....	....	....	....	....	....	....	....	....	....
Simpson Gd	....	....	....	....	....	....	....	....	....	....	....	....	....
Sonora Con	....	....	....	....	....	....	....	....	....	....	....	....	....
South Pacl.	....	....	....	....	....	....	....	....	....	....	....	....	....
Standard	....	....	....	....	....	....	....	....	....	....	....	....	....
Sullivan	.90	.89	.92	.90	.91	....	.90	....	....	....	.95	....	2,000
Sutro Tun.	....	....	....	....	....	....	....	....	....	....	.15	....	100
Sycamore	....	....	....	....	....	....	....	....	....	....	....	....	....
Twin Lead.	....	....	....	....	....	....	....	....	....	....	....	....	....
Vizina	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....

PHILADELPHIA MINING STOCKS.

	Dec. 7.		Dec. 8.		Dec. 10.		Dec. 11.		Dec. 12.		Dec. 13.		Sales.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Amer. Cons.	....	....	....	....	....	....	....	....	....	....	....	....	....
Argent	.18	.17	.19	.18	.19	.17	.19	.18	.19	.18	.17	....	16,700
Arizona So.	....	....	....	....	....	....	....	....	....	....	....	....	....
Battle Mt.	....	....	....	....	....	....	....	....	....	....	....	....	....
Buena	....	....	....	....	....	....	....	....	....	....	....	....	....
California	....	....	....	....	....	....	....	....	....	....	....	....	....
Calista	....	....	....	....	....	....	....	....	....	....	....	....	....
Chrysolite	....	....	....	....	....	....	....	....	....	....	....	....	....
Cincinnati	.08	....	....	....	....	....	....	....	.09	....	.07	....	2,750
Comprom'e	....	....	.25	....	....	....	.27	....	.35	.29	.36	.35	4,194
Contention	....	....	....	....	....	....	....	....	....	....	....	....	....
Con. Virg.	....	....	....	....	....	....	....	....	....	....	....	....	....
Dauntless	....	....	....	....	....	....	.02	....	.02	....	.01	....	4,700
Del Monte	....	....	....	....	....	....	....	....	....	....	....	....	....
Denver City	....	....	....	....	....	....	....	....	....	....	.16	....	1,100
Eureka	....	....	....	....	....	....	....	....	....	....	....	....	....
Girard	....	....	....	....	....	....	....	....	....	....	....	....	....
Governor	....	....	....	....	....	....	....	....	.02	....	....	....	500
Grand Uni'n	....	....	.03	....	....	....	....	....	....	....	.02	....	6,100
Green Mt.	....	....	....	....	....	....	....	....	....	....	....	....	....
Gunnison	....	....	....	....	....	....	....	....	....	....	....	....	....
Homestake	....	....	....	....	....	....	....	....	....	....	....	....	....
Horn Silver	....	....	....	....	....	....	....	....	....	....	....	....	....
Iowa Gulch	.04	....	.05	....	.05	....	.05	....	.05	....	.04	....	30,100
Iron Silver	....	....	....	....	....	....	....	....	....	....	....	....	....
King Bul'on	....	....	....	....	....	....	....	....	....	....	....	....	....
Ledger Con.	....	....	....	....	....	....	....	....	....	....	....	....	....
Little Dia'd.	....	....	....	....	....	....	....	....	....	....	....	....	....
Little Matd	.02	....	.03	....	.03	....	.03	.02	.03	....	.04	.02	15,100
Little Pitts.	....	....	....	....	....	....	....	....	....	....	....	....	....
L'g & D'y H	....	....	....	....	....	....	....	....	....	....	....	....	....
Montana	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Sheridan	....	....	....	....	....	....	....	....	....	....	....	....	....
Navajo	....	....	....	....	....	....	....	....	....	....	....	....	....
North'n B'l	....	....	....	....	....	....	....	....	....	....	....	....	....
Orion	....	....	....	....	....	....	....	....	....	....	....	....	....
Orion Pref.	....	....	....	....	....	....	....	....	....	....	....	....	....
Palmetto E.	....	....	....	....	....	....	....	....	....	....	....	....	....
Pembina	....	....	....	....	....	....	....	....	....	....	....	....	....
Penn-Breck	.04	....	.05	....	.04	....	....	....	....	....	....	....	3,000
Permanent	....	....	....	....	....	....	....	....	....	....	....	....	....
Pizarro	....	....	....	....	....	....	....	....	....	....	....	....	....
Pizarro Ex.	....	....	....	....	....	....	....	....	....	....	.02	.01	7,500
Potosi	....	....	....	....	....	....	....	....	....	....	....	....	....
Rara Avis	.11	....	.12	....	.11	....	.12	.11	.12	....	.10	....	5,600
Rara Avis E.	.07	....	.07	....	.08	....	.07	....	.08	....	.07	....	10,600
Record	....	....	....	....	....	....	....	....	....	....	....	....	....
Rico Pion'r	....	....	....	....	....	....	....	....	....	....	....	....	....
Sierra Apac.	.15	....	....	....	.15	....	....	....	....	....	....	....	600
Sierra Be.la.	.33	.30	.35	....	....	....	....	....	....	....	....	....	1,200
Sierra G'nde	.60	.57½	.65	....	.65	....	.62½	....	....	....	.65	....	4,600
Sierra Nev.	....	....	....	....	....	....	....	....	....	....	....	....	....
Silver Cord	....	....	....	....	....	....	....	....	....	....	....	....	....
Silver King	....	....	....	....	....	....	....	....	....	....	....	....	....
Silv'r Plume	....	....	....	....	....	....	....	....	....	....	....	....	....
Sonora Con.	....	....	....	....	....	....	....	....	....	....	....	....	....
Standard	....	....	....	....	....	....	....	....	....	....	....	....	....
Sultana	....	....	....	....	....	....	....	....	....	....	....	....	....
Sutro Tun'l.	....	....	....	....	....	....	....	....	....	....	....	....	....
Tombstone	....	....	....	....	....	....	....	....	.65	....	....	....	200
Victor	....	....	....	....	....	....	....	....	....	....	....	....	....
Yale Mt.	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....

Iron 1·70@1·80c. Business is unsatisfactory, and large consumers refuse to place orders until after January 1st. The rescinding of the resolution of the nail-makers to suspend production has checked business, and given prices a downward tendency. Quotations are $2.40@$2.50, with offers at $2.30@$2.35. Wrought Pipes are quoted at 7 per cent off, and Tubes at 60 per cent off. A sale of Old Rails is reported at $24.50. Several offers are in hand at $23.50@$24. Steel Rails sell in small lots at $36. There are offers at $35, shaded. Scrap is dull. There have been no sales of crop-ends. The Homestead Bessemer Steel-Works closed down last Saturday, and the Edgar Thomson Works will probably close this week. A good many mills are working half-time. A change in the situation of the glass trade is expected in a few days. The coke pool is not yet settled.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Dec. 14.

Anthracite.

Under the pressure of very unfavorable weather, the market continues exceedingly dull, and there is a general uneasiness among sellers as to the near future. It is well known that there is not cordial co-operation among the companies, and there are disquieting rumors which are not calculated to inspire confidence among buyers or sellers. So far as the former are concerned, the companies could not more successfully have destroyed confidence had they gone to work deliberately to do it. The mismanagement of the trade during the summer and early fall is now bringing its fruit, though it is only just to say that the state of the weather has aggravated the evil beyond the fears of those who have most disapproved of the hesitating and illogical policy pursued. There may be some comfort in the fact that the companies are even now beginning to discuss January, although, so far as we can learn, no decision has been reached concerning the action to be taken. If negotiations drag as they did in reference to December, work has been begun none too early. We trust that the present condition of affairs may prove a warning that will be heeded—a hope that will probably be regarded by many as strongly optimistic.

Buyers, encouraged by past concessions, are expecting all sorts of low figures, and it is difficult to move them from a position which unbiased observers are quite ready to admit is warranted by the facts.

Pittsburg.

Railroad trade is flat on its back for at least three good causes: Railroads themselves are not large consumers; for their engines are not as busily employed as a month ago. Then the rail trade, giving employment at this point to the largest class of mills, is dead, and shutting down is the order of the day. Pan-Handle pits are working less than one third time on an average. Some work quarter-time and some large railroad pits are shut down altogether. Among the latter are the Duquesne Works of the New York & Cleveland Gas-Coal Company, near this city, on the Pennsylvania Railroad. They employ over 200 miners. The Mansfield Coal and Coke Company, Pan-Handle region, closed two of its works, and smaller concerns are following suit. Quoit-pitching along the Pan-Handle is pursued to an extent that clearly shows how many idle miners there are at present. Prices are nominally 6¼@6½ cents on the wall, but actually are whatever the necessities of the seller make them. Sales at 5½c., and even less, are reported. Another reason for this dullness is the warm weather. No domestic consumer is in a hurry for coal, and the yard dealers are disgusted. Still another reason lies in the fact that this is the "off" season of the year in other respects. New contracts on account of lake and gas and other orders do not come in until early next year. The present is the hibernating season of the coal trade here, and this restfulness is only intensified by the extreme dullness of demand from iron and steel concerns and glass-houses. In fact, the trade has not been in its present shape for years, and I trust will not pass through another such period for years to come.

River operators join their growl with that of the railroad trade. With second pool coal selling at 7c. and less at Cincinnati and Louisville, the cloud over this trade here has not even a silver lining. Work is fairly brisk at the pits, for the reasons outlined in my last, but stocks below and the mild winter, added to causes already enumerated, conspire to make December, 1883, a dismal epoch in the history of the river trade in this city.

Buffalo.

One of the great improvements of the Lehigh Valley Railroad on the Tifft farm was completed Saturday, and operated for the first time. The work referred to is the mammoth double coal-stocking trestle, which is 2100 feet long, and the largest of its kind probably in the United States. Cars are to be run upon the trestles, and their contents dumped on to an elevated platform, under which is a tunnel 1385 feet long. There are 275 gates in the platform; and when these are operated, the coal is to be spouted into cars running through the tunnel. There is room for 96 coal-dumps in the tunnel, and it is estimated that one car can be loaded every five minutes. The platform has a capacity for holding 150,000 tons of coal at one time, and the company will thus be able to keep a large supply on hand to meet any emergency.

Three large Clyde-built steel propellers lately arrived here from Scotland—in sections—via the St. Lawrence River and canals, Lake Ontario, the Welland Canal, and Lake Erie. At Montreal, on their arrival from sea, it became necessary to cut the hulls in two, and the sections were placed on pontoons, thus enabling them to be taken through the shallow canals on the St. Lawrence route. These vessels are to run in connection with the Canada Pacific Railroad from Algoma Mills, Georgian Bay, to Port Arthur, Lake Superior, a distance of 350 miles, and will be fitted up for passengers as well as for freight. They can not leave here now, of course, until next spring, although the work of reconstruction is nearly completed. They will receive their upper cabins and other appointments at some place in Canada. The two other boats of the line will be sent from Scotland at the opening of navigation in 1884. The names of the vessels are the Algoma, Alberta, and Athabaska.

Horsford's Acid Phosphate.

Admirable Results in Fevers.

DR. J. J. RYAN, St. Louis, Mo., says: "I invariably prescribe it in fevers; also in convalescence from wasting and debilitating diseases, with admirable results. I also find it a tonic to an enfeebled condition of the genital organs."

WANTED.—POSITION AS RESPONSIBLE business agent or manager of mines or metallurgical works, by a gentleman of long experience in similar positions in Nevada and Colorado. Address
MANAGER,
P.O. Box 203, N. Y. City.

OFFICE OF
VAPOR FUEL COMPANY,
Rooms 28 and 29 EQUITABLE BUILDING,
BOSTON, Mass., Oct. 3, 1883.
The VAPOR FUEL CO. is prepared to contract for the use of its process and to furnish the necessary Machinery and Apparatus.
Iron and steel manufacturers, manufacturers using steam-boilers, smelters of ores, and others, are invited to examine the Process and inform themselves by seeing it at work upon a commercial scale. S. S. HENKLE, Pres.

TO INVESTORS.

The Keith Electric Company, having secured and paid for valuable patents covering a complete system of electric lighting, and having demonstrated the economy and reliability of their light, are now prepared to push its introduction with the utmost energy. For this purpose a limited amount of the stock is offered at $20 per share.
For full particulars address
AUSTIN GALLAGHER,
Drexel Building,
Corner Wall and Broad Streets, New York.

NEW MAKE OF MINE LAMP.

LEONARD BROS., Scranton, Pa.

ADAMANTINE SHOES AND DIES

WE MANUFACTURE THE ABOVE

ADAMANTINE SHOES AND DIES.

They have been in use on the hardest Quartz, both in the Territories and South America, for the past five years, and we warrant them to outwear three (3) sets of the best cast-iron. We also manufacture the best Rock Drill and Tool Steel in the market.
For further particulars, address
CHROME STEEL WORKS,
Brooklyn, E. D., N. Y., U. S. A.
S. H. KOHN, Proprietor.
C. P. HAUGHIAN, Superintendent.
When ordering, a rough sketch with full dimensions, is all that is necessary.

C. G. HUSSEY & CO.

COPPER AND BRASS

ROLLING-MILLS.

All sizes and shapes of Sheet and Bar Copper and Brass

ALSO

CRUCIBLES,

For Steel, Copper, Brass, Etc.

PITTSBURGH, PA.

MINING MACHINERY

INCLUDING

Steel Water Jacket Smelting Furnace,

Quartz Mills, Concentration Works, Hoisting Apparatus, and all classes of Machinery employed in Mining and Reduction of Ores.

PORTABLE AND STATIONARY

STEAM ENGINES

From Ten to Two Hundred Horse Power, Steam Boilers of any Style and Capacity.

SAW MILLS

Adapted to the wants of the Planter, Miner, or for the manufacture of Merchant Lumber, Prices ranging from

$200

Upwards, and of Capacity from 2,000 to 50,000 Feet per day. Shaftings, Hangers, Pulleys, Gearing, and all Appliances for the Transmission of Power.

LANE & BODLEY CO., Cincinnati,

Western office: [illegible] First South St., Salt Lake City, Joseph M. Locke, C.E., M.E., etc., Consulting Engineer. ☞ *Treatise on Smelting and other Circulars sent Free.*
Sole Manufacturers of the Bruckner Revolving Furnace.

DIVIDENDS.

HOMESTAKE MINING COMPANY, MILLS BUILDING, 15 BROAD STREET,
NEW YORK, Dec. 13, 1883.

DIVIDEND NO. 64.

The regular monthly dividend, TWENTY CENTS per share, has been declared for November, payable at the office of the transfer-agents, Lounsbery & Haggin, Mills Building, 15 Broad Street, on the 26th inst.
Transfer-books close on the 20th inst.

LOUNSBERY & HAGGIN, Transfer-Agents.